THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVII. No. 2154.] LONDON, AUGUST 23, 1904. [56TH YEAR. PRICE 6d.

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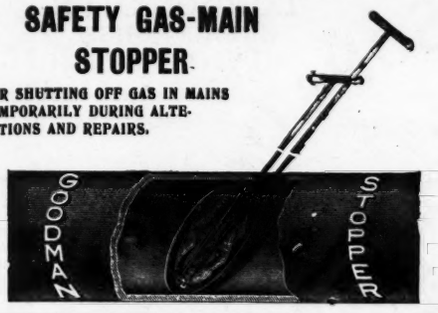

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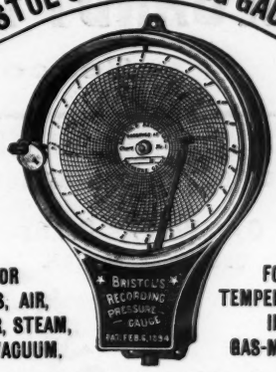

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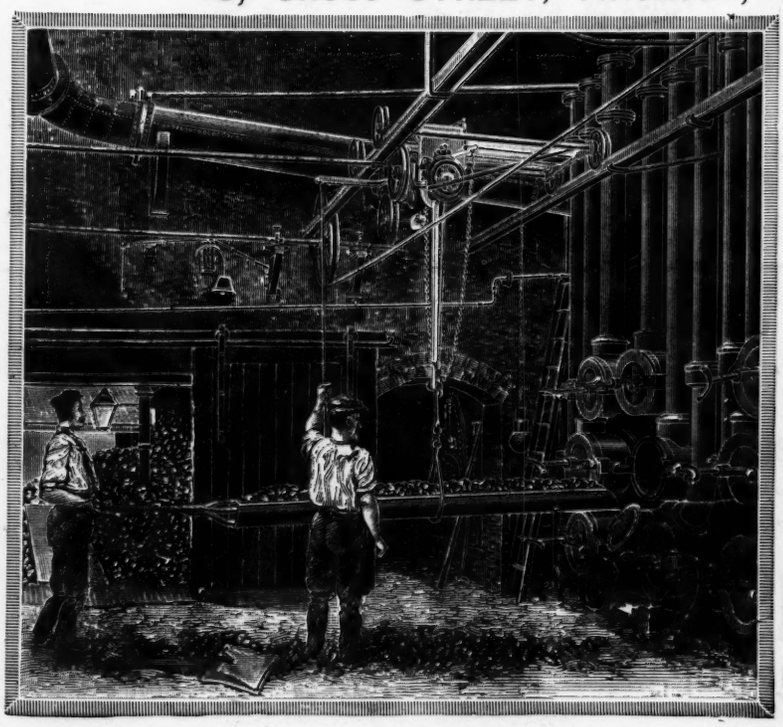

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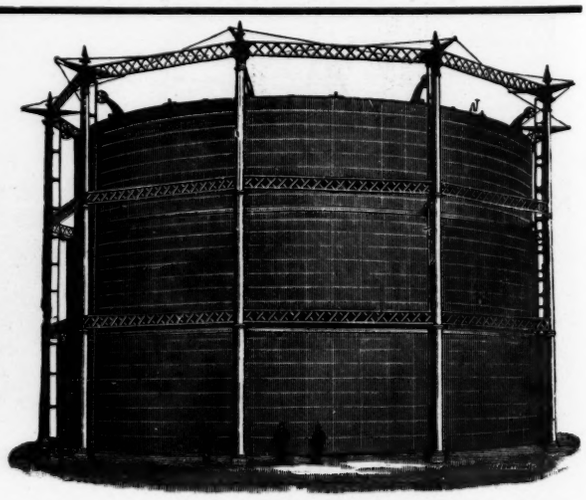

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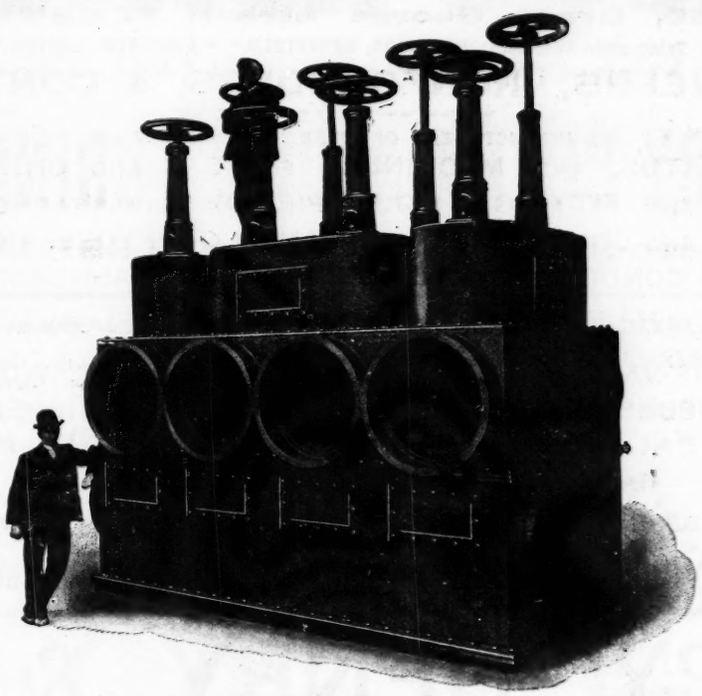

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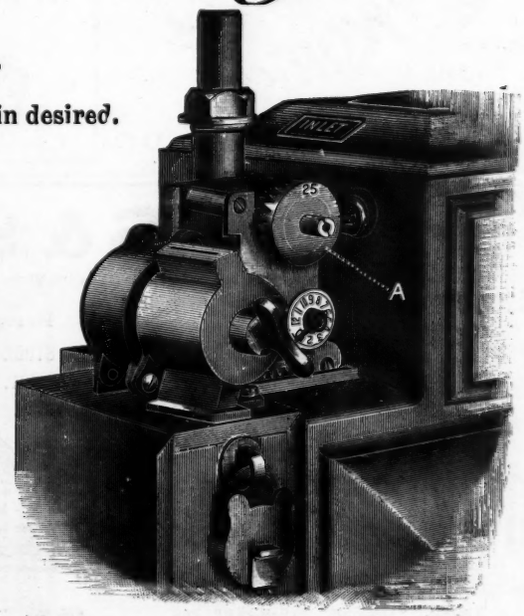

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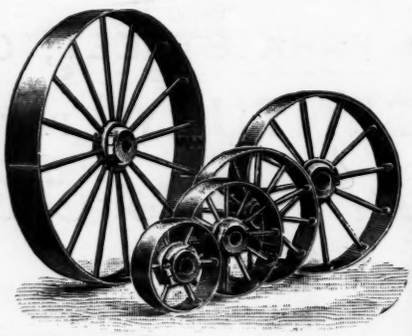

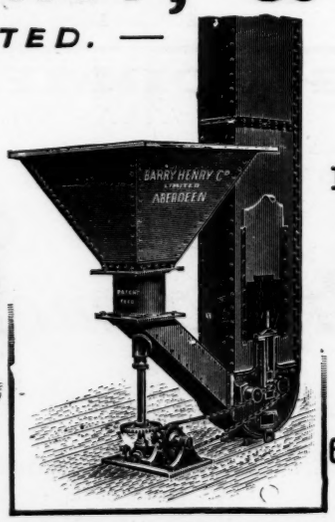

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Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

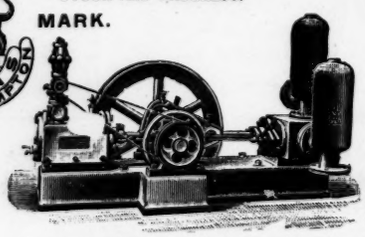

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Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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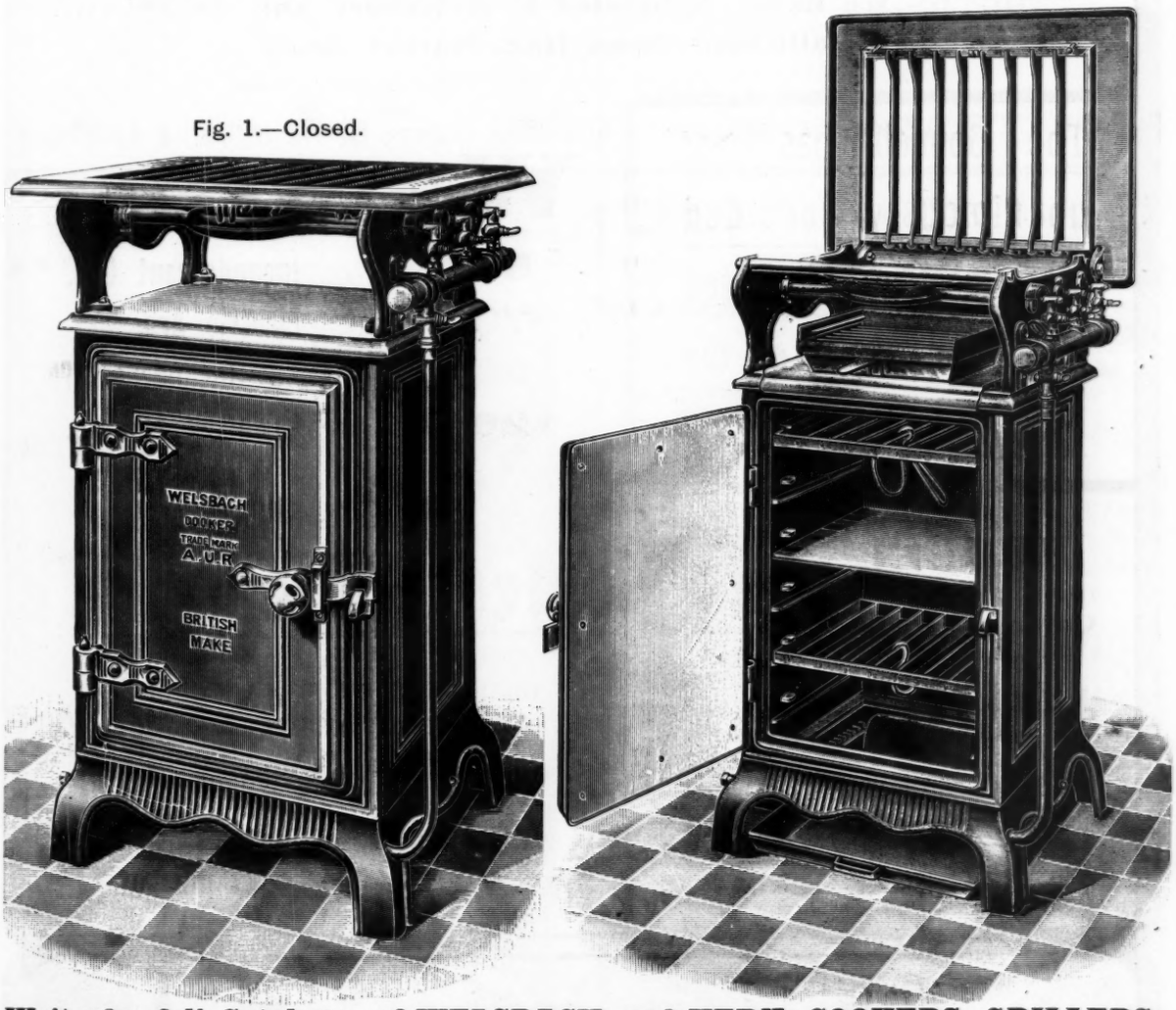

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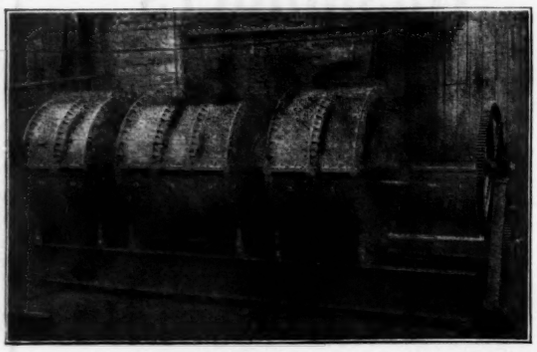

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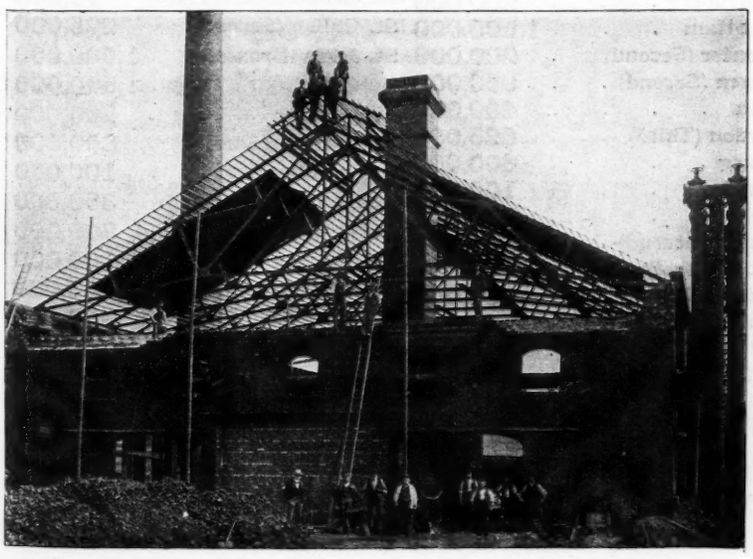

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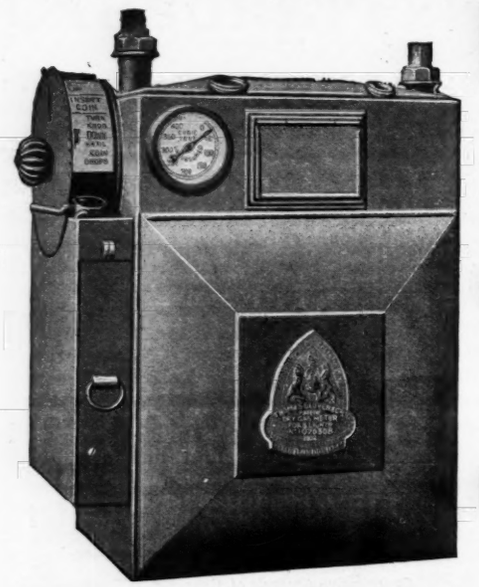

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EDITORIAL NOTES—GAS, &c.

Penalty Testing.

WHEN the full significance of the recent pronouncement on this subject made by Sir George Livesey comes to be realized, it is not improbable that surprise may be expressed that the idea was not thought of before. The abolition of penalty testing would assuredly point the way to that greater development which all are agreed is in store for the gas industry in the supply of gaseous fuel. The first step towards freedom in this respect was gained—perhaps unconsciously—in 1900 by the reduction of the South Metropolitan Company's standard of illuminating power from 16 to 14 candles. This lower quality proved to be ahead of the Company's arrangements for the production of low-grade gas; so that from that time until now, there has never been any difficulty in fulfilling the statutory requirement without recourse to enrichment of any kind. Indeed the chief embarrassment has perhaps been in the opposite direction. But gradually the carbonizing arrangements have been brought into line with the new conditions; and the economical advantages of the reduction have become more and more apparent. Already a substantial increase has been effected in the production of gas per ton of coal carbonized; and this may be regarded as an earnest of more to come, since all information on the subject tends to show that the limits of economical carbonization have not been reached.

At the same time, the result has been satisfactory to the consumers. They have had the 2d. per 1000 cubic feet reduction consequent upon the change; they have not been visited with any increase of consumption, as was confidently predicted would be the case; while, as appears from the supplementary evidence given by Professor Boys before the Board of Trade Committee (which was commented upon in these columns a few weeks ago), the gas with which they are supplied is, as regards calorific value per candle, from 5 to 6 per cent. better than that which is sent out by the Company's neighbours, enriched, as this is, by means of carburetted water gas. Professor Boys' tests really showed that there is but little difference in calorific value between the two gases—notwithstanding the difference in illuminating power. The chief significance attaching to these tests is the light which they may throw upon the comparative ease with which the Companies are enabled to fulfil their statutory obligations. As a matter of course, the higher the standard the greater must be the difficulty in complying with it; and, it may also be said, the greater the barrier opposed to economical carbonization. The time must come—and perhaps soon—when the South Metropolitan Company will experience a similar difficulty in maintaining their 14-candle standard. A fresh significance will then attach to the inquiry which was made by the Chairman of the Committee on the South Metropolitan Company's Bill of 1900, "Why not go for 12 "candles?" Any statutory restrictions must sooner or later become a bar to progress. When accompanied by a penalty for non-observance of it, the anomaly is doubly apparent.

What is likely to happen if there were to be no restrictions as to illuminating power? What, it may be asked, in reply, does actually happen in the case of non-statutory companies, who are under no restrictions? Do they serve their customers badly? Assuredly not; for if they did, they would hear of it to their cost. This is Sir George Livesey's point; and it cannot be too strongly urged. Many of these Companies are supplying large quantities of gas yearly, without one word against them being ever heard. All the profits they can make belong to their shareholders; and the consumers have no voice at all in the disposal of them. The latter, however, under the sliding-scale provisions, become the predominating partner. Why, under an arrangement which secures to them five-sixths or six-sevenths of all the profit that can be made out of a gas undertaking, should penalty testing be considered necessary? The fact is that this is merely the survival of an idea which has been outlived. There is no more necessity for penalty testing in the case of gas than there is in the case of electricity, if half so much.

The sulphur restrictions are doomed; and when they finally disappear, the local authorities will have one stick the less with which to beat the dog. But another and possibly more serious danger has arisen, in the prospect of the imposition of a calorific value test. Why should this be at all necessary, unless it be with the object of limiting the use of either blue or carburetted water gas, having a much lower calorific value than pure coal gas. This would assuredly be a mistake; for no one can tell what developments may take place in this connection, nor are there any known bounds that could be set to a reduction of calorific value with economical advantage to all concerned. The gas of the future may possibly have a calorific value of 500 B.T.U., as suggested by Professor Lewes—though at the moment there does not seem to be any special reason for holding such belief; or something of lower value may be found most economical; or, again, it may be necessary to proceed by steps. We incline to the latter view; but there must be no penalty testing to block the road. Gas companies are as much to be trusted as are local authorities owning gas-works, who, practically speaking, have it all their own way in the matter of testing.

Commercial Company's Meeting—Prospects of Action on the Testing Committee's Report.

THE art of public speaking includes the ability to interest on topics that have already been treated upon by masters of exposition and criticism. That ability is a possession of the Chairman of the Commercial Gas Company (Mr. W. G. Bradshaw) in an eminent degree. After Sir William Makins and Sir George Livesey, at three separate meetings, have handled the questions of the hour both for the Metropolitan Gas Companies and for the gas industry at large—that is to say, the questions to which form has been given by the recent Board of Trade Committee—Mr. Bradshaw brings up the rear, and succeeds in adding fresh interest to them, though it had almost appeared that the final word must have been said till action was taken to give legislative effect to the recommendations, or to convince Parliament of the impossibility of certain of them. The Chairman of the Commercial Company is neither an ornamental head nor a copyist. He takes nothing for granted, on even expert assurance, without personal investigation; and he maintains, as the right of his position, an independence of view and speech which finds its end in the vigour and interest of his addresses every half year to the proprietors of his Company—a sample of which they again enjoyed last Thursday.

The Company are in a peculiar position in connection with the report of the Board of Trade Committee. They are bound to approach Parliament very soon; and, from present appearances, it looks as though the rather disagreeable duty of having to "pull the chestnuts out of the fire" will fall upon them. Mr. Bradshaw has no hope that the Board of Trade nor the London County Council will initiate sufficiently early legislation to give effect to the Committee's recommendations; and time is an important matter with the Commercial Company, seeing that the last occasion they approached Parliament a condition as to the testing of their gas was imposed upon them which left in abeyance the final settlement of the method until the issue of the report of the Departmental Committee. But now that the report has been issued, the difficulty of obtaining a satisfactory settlement is greater than if there had been no Board of Trade Committee and no inquiry. The mode of gas testing is the only point which for the Company needs immediate attention and definition; and that is, of course, the one point covered by the recommendations which cannot possibly be willingly accepted by the Company, and upon which the Chairman poured unmeasured ridicule. There can be no mistake about this, that the question of gas testing will have to be fought

all over again in Parliament. Mr. Bradshaw is resolute; and he is backed by a strong and equally resolute Board. "I "think," he says, "that we should claim, and maintain our "claim, that there should be no departure from the principle "laid down so long ago as 1868. . . . There should be "no going away from this point; and we should go on until "we get justice." Here the Company nail up their colours; and round those colours will come—the prospect seems quite clear—the first fight in Parliament over the Board of Trade Committee's recommendations. If the Company have to go to Parliament next session, as it were, single-handed, it will not be their own fault. Plainly Mr. Bradshaw declares, for the information of all whom it may concern, that the Gas Companies—being the parties most interested, and most in touch with the consumers—are in combination the right people to promote legislation. It is proposed that the Chairman of the three Companies should meet and discuss this question of promoting a Bill; but, while Mr. Bradshaw is fully prepared to do his part, past experience of the gas supply of the Metropolis does not inspire in his mind any hopeful feelings that the Companies can or will amalgamate their forces in going to Parliament. This is a matter upon which silence for the moment may be more useful than comment. It is apparent, however, that the Chairman himself has very little doubt on the subject, in view of his intimation to the proprietors that "it may be, when we meet "you next, you will be asked to give your authority to the "promotion of a Bill on behalf of the Commercial Com- "pany *alone*."

On the general business of the Company, the Chairman found his lines cast in pleasant places; and he was happy in his surroundings. The financial and manufacturing results of the half-year's working had been excellent; and, with the increasing roll of consumers, the prospects—notwithstanding the presence of the fringe of a cloud of trade depression—are also good. There is a lot of vitality in the Company's district yet; and every point of the Chairman's speech indicates it. All the capital under the old 1875 Act has now been issued; and the shareholders on Thursday sanctioned the raising, as it is required, of £150,000 more capital stock and one-third debenture. In this connection it may be said that the Company have already felt the satisfactory results of offering their stock to the consumers and their own employees; so much so that they are proposing to follow up the policy of concentrating as much stock in the district as possible, by offering it in small parcels at a time, in order—the district being a comparatively poor one—to spread the opportunities of the consumers and employees as far as they conveniently can. It is another good sign from the proprietors' point of view that it is extending business that requires the investment of further capital rather than new works; and add on to this the facts that the fixing of new coin meters and stoves in the past six months carried the peak of the half-yearly increases in this respect to the highest point in the records of the Company, that the price of gas is now a penny lower than before, and that the Company—being now in possession of sufficient of the special steamships for conveying their coal to the works, instead of having recourse to the old expensive system of barging up the Lea—are now saving a substantial sum per ton on the cost of the coal deposited on the works, there is every reason for a placid and pleasant contemplation of the future. Their share in past, and the promotion of means to future, successes, brought to the Chief Engineer (Mr. Stanley H. Jones), his staff, and men due acknowledgment at the meeting on Thursday. That meeting, it is also interesting to note, is the fiftieth which Mr. H. D. Ellis has attended in his capacity of Secretary to the Company.

The Past and Future of the Liverpool Gas Supply.

At two half-yearly meetings in succession, the shareholders of the Liverpool United Gas Company have had to listen to announcements of the retirement of gentlemen who have for many years held the most prominent positions in connection with the active management of the undertaking. At the meeting held early in the year, the Chairman, Sir Edward Lawrence, informed the proprietors of the relinquishment of the chief engineership of the Company by Mr. William King; while last Thursday he apprised them of his own intention to vacate the chair which he has so ably filled for the past 23 years. Thus in the space of only a few months this important undertaking has been deprived of the active services of its leading technician and administrator. The events are significant. To have been associated, as Mr. King was, personally and by family connections, with the gas supply of Liverpool since the year 1816—an ever memorable time, when labour was busily engaged in the destruction of the ingenious machines designed for its relief—and for nearly fifty years with the Company responsible for maintaining that supply, was surely a unique experience. It might almost be said to have been a privilege; for, after all, it is something to have had charge of the manufacturing operations of a business such as that of gas supply—the provision of light and warmth in thousands of homes. What has been the result of the efforts of the two gentlemen who have now stepped aside to give place to younger men, since their association? There has been a rise from 2300 to 4000 million cubic feet, or 80 per cent., in the make of gas; an increase from 9830 to 11,282 cubic feet in the production per ton of coal carbonized, resulting from the introduction of improved plant; and an augmentation from 57,767 to 107,071 in the number of consumers. All this has been achieved in face of the competition of the electric light, which, as in the case of other gas companies, has caused the loss of some consumers, small and large. Concurrently with the growth of the business, the price of the commodity sold has been reduced until it now stands at 2s. 8d. per 1000 cubic feet—a lower figure than it has ever reached in the Company's history. The net result of their labours is that they hand over to their successors a property which Sir Edward Lawrence considers as safe as it is possible for any commercial undertaking to be.

What is to be the future of this undertaking in the hands of those who now control it? Is it to be simply continued progress along the old ways which have led to its present prosperous position, or development on lines which are coming to be regarded as those upon which the business of gas supply is most susceptible of expansion? We are quite ready to acknowledge that, under Sir Edward Lawrence's guidance, what he aptly called the "dual character" of the Company was duly recognized, and that it was his aim to prevent the exceptional privileges of the shareholders being strained to the disadvantage of the consumers. Evidence of this is, indeed, afforded by the fact that while the former have regularly received full dividends, the latter have been supplied with gas of high quality at a price which has gradually been brought down to its present figure. This is very satisfactory. But surely finality has not been reached in this respect; and it is to be regretted that Sir Edward's valedictory address did not contain some reference to an immediate or prospective reduction. That this was looked for is manifest. The inhabitants of a commercial city like Liverpool are naturally on the alert to discover any means of cheapening their commodities; and when one presents itself, the conductors of the local Press are too keenly alive to the public interests to allow it to remain very long unnoticed. Consequently, a few days before the meeting, the attention of the citizens was called by one of the papers to the trend of recent legislation in the direction of lowering the standard illuminating power of gas; and effective use was made of the very able paper read by Mr. Napier at the recent meeting of the North British Association of Gas Managers in support of the proposition that a change in the direction indicated would be no detriment to the consumer as a light-user, while it would enable the producer to supply at a cheaper rate.

Dealing with this matter at the meeting, Sir Edward Lawrence showed very clearly that low-power gas is not favourably regarded in the Liverpool board-room; and therefore the Directors have not seen their way to asking Parliament to sanction any reduction of the existing standard. Speaking personally, he said he was convinced that, "if such a thing were done, there would soon be a great out- "cry among those who use gas for illuminating purposes." Yet the change has been made over a large portion of the Metropolis, and we have not heard of the consumers rising in their thousands to complain of their light, and demand a reversion to the old system. What differentiates the city on the Mersey from the one on the Thames to give rise to fear of such an eventuality? The Liverpool Company have always occupied an exceptional position among similar undertakings in the supply of 20-candle gas; but whether it will be good policy to hold it tenaciously, in view of the general tendency to adopt much lower standards of illuminating power, is a matter to which those who are now at the head of the

administrative and technical departments of the Company will doubtless give serious consideration. Their object will be to develop the business; and they do not require to be told that a very good way of doing this is by selling gas at as low a figure as possible. The consumers have had their attention directed to one means of effecting economy in the production of their commodity. If they will be satisfied with the quality of the cheaper article so produced, why should they not be allowed to have it? Events will show whether in this matter the Company will come down to the level of most of the others, or elect to occupy in the world of gas a position of "splendid isolation."

The Irish Association Meeting.

TIME is dealing kindly with the Irish Association of Gas Managers. Seventeen years ago a handful of fourteen gas managers in the North of Ireland met together in Armagh —on the invitation of Mr. James Whimster—and formed an Association which was intended to bring to the members some of the benefits which Mr. Whimster, before he took up his abode in the Emerald Isle, had seen to be derived from mutual conference by his brethren in his native land. The scheme of the Association was much more modest than subsequent circumstances have caused the members to adopt. There were difficulties (in the matters of distance and the like) in the way of managers from all parts of Ireland meeting together; and so the Association was confined to the northern half of the country only. But southern members began to be attracted; and the Association then extended its boundaries so as to include the whole of the island. In fact, the pendulum swung south; so much so, in fact, that in the two years preceding this, the annual meetings were held in the extreme southern cities of Cork and Waterford. The success attending these meetings justified the step which had been taken. This year the northern half has again been visited. It was felt that the time had come when Mr. Whimster—the founder of the Association, and its Hon. Secretary and Treasurer from the beginning—should be honoured with the chief post in the gift of the Association. Accordingly, at last year's Waterford meeting, he was elected President; and it followed, almost as a natural sequence, that the meeting over which he was to preside should be held in the city of his labours. Now that the meeting has been duly held, there can be no other feeling than that of gratification at the way in which things have happened. The members of the Association and other friends turned out in strong force, and not only so, but the Directors of the Armagh Gas Company lent their active aid in making the meeting a memorable one. Nor were congratulations confined to words only; for the Committee of the Association, making a new departure, presented the President with a gold medal to commemorate his year of office.

Mr. Whimster is a powerful, although not ostentatious, force in gas circles in Ireland. No better proof of this could be found than in the exceedingly common-sense address that he delivered as President, which was described by one of the members as a coming-down to the level of his hearers, although a more apt illustration might perhaps have been a highly-reasoned endeavour to lift his hearers up to his own level. As to the other business transacted, it may be remarked that it has been a custom of the Association to fill up a portion of the meeting day with a lecture by a distinguished scientist in gas matters. This year they were able to secure the services, in that capacity, of Professor Vivian B. Lewes; and in doing so they added lustre to their meeting, while, at the same time, the engagement testified to their enterprise. There was only one paper by a member before the meeting—that by Mr. G. Airth, of Dundalk, upon "Keith's High-Pressure Lighting" in that town. The paper (which will be given next week) will be read with interest, as will also the remarks made upon it by the members.

The Association, during the day, considered the subject of affiliation with the Institution of Gas Engineers. The Committee took the course of consulting the members; but in laying the subject before the Association, they did so with no uncertain sound. They were unanimous in favour of affiliation; and after a few questions had been asked and answered by the Committee, the members as a body cordially approved of the scheme for the promotion of the solidarity of the gas industry. In doing this, they undoubtedly lift themselves up, and, as was said, place themselves in line with other Associations. One of the questions asked was as to the benefits to be derived by the members from affiliation. They have, for one thing, had visits from distinguished members of the profession from this side of the Channel before now; and it is no stretch of the imagination to say that, with affiliation accomplished, these visits will be encouraged rather than otherwise—and no one will venture to entertain any other belief than that such visits are of the greatest benefit to the individual members of the Association.

Purification of Gas by Ammonia.

TO-DAY we commence the publication of a theoretical and practical consideration of the purification of gas by ammonia, from the pen of Mr. Thomas Holgate. As is known to most of our readers, the subject has for many years engaged the attention of that gentleman; and the information we are now placing at the disposal of the gas industry, embodies much of the experience gained by him in the application of revivified ammoniacal liquor at the Halifax Corporation Gas-Works.

That economical purification may be a means of securing collateral economy in the carbonization of coal or in the generation of carburetted water gas, is a factor that should not be overlooked. Instances there are where coals having a high content of sulphur, or yielding a gas heavily charged with carbonic acid, have been abandoned in favour of others less valuable as a gas producer, solely because of the production of a proportion of impurities above the normal capacity of the washers or purifiers in the gas-works concerned. The experienced gas administrator does not need to be told twice what a great financial advantage may be secured when he can be free to choose in his purchases of coal, unhampered by any such fetters. Every advantage is on the side of the gas maker who has the means within his reach to evolve from the commonest materials the cheapest and the most useful gas. The freedom, from the paralysis due to secondary matters, which tells so much in the regular work of any industry, and in none more than in the gas industry, is never more valuable, lasting, or so much to be desired as when it springs from a superior knowledge and control over the problems of manufacture and supply. That oppressive restrictions from outside should be removed is now becoming recognized; and if their counterpart of an internal character should also be cleared away, then will the prospects of cheap and good gas—already bright—become brighter still.

It is now 26 years since the late Mr. Frank Livesey stated his belief that the removal of all the carbonic acid and sulphuretted hydrogen from crude gas could be accomplished by the Hills process established at the Old Kent Road works of the South Metropolitan Gas Company; and it is 18 years since Mr. Lewis T. Wright (then of Nottingham) affirmed the possibility of the same thing as the result of his experiments and investigations. That so little has been done towards the general adoption of revivified ammoniacal liquor has been a cause of wonder to those who, with adequate knowledge, have at various times within recent years inquired into the subject; and the only explanation forthcoming has been that the slight loss of ammonia in Hills's method neutralized some of the advantages acknowledged to accrue. It is at this point where the system employed by Mr. Holgate steps in with the claim to be an improvement upon that of Hills, in that the gases driven off from the liquor being purified must pass through sulphuric acid, thereby effectually retaining the valuable ammonia, without impairing, but on the other hand increasing, the efficiency of the revivifying process.

The practical results to be given in succeeding issues of the "JOURNAL" represent the work accomplished in the No. 2 section of the Halifax Gas-Works, where plant for liquor revivification was installed in November, 1893, and where a scrubber, 45 feet high by 30 feet by 10 feet, was added in 1896-7. In order to guard against possible misapprehension, it should be pointed out that the large scrubber, 90 feet high, that was referred to in the "JOURNAL" on the occasion of the visit to Halifax of the Institution of Gas Engineers in the autumn of 1902 was erected for the No. 1 section, at the time of the reconstruction of that part of the works. Alongside this scrubber was placed the plant for the revivification of the ammoniacal liquor to be used therein.

But as the plant was not completed in the period for which accounts are available, it does not enter into the questions discussed in the present series of articles. That combined scrubber and liquor revivification plant was designed for the almost complete removal of sulphuretted hydrogen and carbonic acid from coal gas and water gas—the last traces to be removed in the purifiers; and it was based upon the experience gained with the earlier or pioneer plant in the No. 2 section. The erection of the pioneer plant was, we are given to understand, followed by a better knowledge of the right application of the more active liquor; and these steps of progress are set forth in the costs of working, and in the analyses of gas and liquor that accompany the text of the articles.

That this contribution to the knowledge and practical working of an important part of gas manufacture is destined to be of considerable use is, we believe, a quite reasonable expectation, especially as the benefits need not be confined to coal gas but may be shared by carburetted water gas. The high cost of purification of the latter gas from carbonic acid has often been the cause of abnormal oil consumption —a costly expedient which would doubtless be readily abandoned in the presence of a cheap and efficient system of liquor purification.

With these remarks (by which we have endeavoured to indicate the far-reaching influence of questions of purification), we must ask the attention of our readers to the text, and the tables that form an integral part of the communication. The latter may not be an attractive form of conveying enlightenment; but they must, of necessity, be closely examined if the substance of the information given, and the comparisons instituted, are to be fully grasped.

The New Procedure of the Patent Office.

Inventors who contemplate availing themselves of the British Patent Office will do well to bear in mind the fact that, with the current year, will pass away the state of practice in this Office which has prevailed ever since the grant of Royal Letters Patent for inventions came into operation. Section 1 of the Patents Act, 1902, which will be put into force on Jan. 1, 1905, will make a revolutionary change in the procedure of the Department, and introduce a system differing in many important respects from that prevailing in any other country. It has invariably been maintained in the "Journal" that the British Patent system, with all its faults, is, notwithstanding, the best in the world. Of course, it has imperfections; but the same can be said of all others, and most foreign patent systems are vitiated by downright faults of the first magnitude, from which our own is happily free. The worst fault that could be imputed, with reason, to the British Patent system of old was, as a matter of fact, not a part of it. This was the facility which it was asserted to extend to foreign patentees for the pursuance of a policy unduly favourable to themselves and injurious to the native industry. It was, after all, more a question of international law. This defect, however, has been removed. The forthcoming change of practice consists in the adoption by the Office of the system of search for anticipations, so far as it appears likely to assist the applicants. Hitherto, as all the world knows, British patents have been granted at applicants' own risk. This system worked well enough for a long time, during which patentees were rather rarities, and a patent was in every respect considered a serious business. Patentees had to pay highly for their rights, whatever these were; and rarely depended upon their own unassisted skill and knowledge in drafting their specifications and claims. When patenting became popularized, all this was altered. Applicants were encouraged to deal with the Patent Office direct; and many of them then discovered that the giving of advice as to the originality or merit of so-called inventions was no part of the work of the Office. Consequently, a clamour arose for the addition to the British system of something analogous to the official search which forms so conspicuous a feature of some foreign patent systems, notably those of the United States and the German Empire.

It is true that a good deal of this agitation was artificial, and more of it based on ignorance. Those simple British malcontents with the rule of King Log little knew how they would be likely to fare under King Stork. The great majority of British applicants for patents who dispense with professional aid do not take foreign patents at all, which circumstance, naturally, did not at all hinder them from professing admiration of the foreign patent systems. The agitation, however, had the effect of inducing the authorities to hold an inquiry into the possibility of improving the British system; and the result was the passing of the Act of 1902, by which the Office is empowered to examine applications for anticipation and novelty, under certain all-important conditions which adequately preserve the good old English rule of the liberty of the applicant to remain the last judge of his own business. The section of the Act in question states that the complete specification as deposited shall be forthwith examined (in addition to the existing investigations directed to be made by the Act of 1883) "for the purpose of ascertaining whether the invention claimed has "been wholly or in part claimed or described in any specification (other than a provisional specification not followed "by a complete specification) published before the date of "the application, and deposited pursuant to any application "for a patent made in the United Kingdom within fifty "years next before the date of the application." If upon investigation it appears that the invention has been wholly or in part claimed or described in any such specification, the applicant will be informed thereof, and "may" amend his specification, which will then be investigated as before. In the absence of a report of such anticipation, the Comptroller will accept the specification, if otherwise unobjectionable. If he is not so satisfied, the Comptroller will determine, after hearing the applicant, and unless the specification has been so amended as to get rid of the objection, whether any, and if so what, prior specifications ought to be referred to in the specification in the way of notice to the public. It will be observed that there is here no power of rejection, or even of compulsory amendment, conferred upon the Comptroller. This differentiates the arrangement from those of Germany and America. In both these countries the Patent Office authorities have the power of rejection, by which Dr. Von Welsbach was deprived of his patent for incandescent gas-burners in Germany, and Sir Henry Bessemer of the United States patent for his steel-making process. At the present moment, Mr. T. A. Edison has a charge against the United States Patent Office for incompetence, neglect of duty, and maladministration in connection with the dealings of the officials with his accumulator patent. Even friends of the incriminated officials admit that there has been an "error "of judgment" committed by somebody, which, of course, is what might befall anybody. The point of the whole affair, however, lies in the fact that in Germany and America an error of official judgment can kill a patent, and wreak untold harm upon a member of the public which the Office exists to serve; and this cannot happen under the English system, new or old.

Croydon Gas Company.

"Well done" was the dominant note of all the speeches that came from the proprietors' side of the table at the meeting of the Croydon Gas Company on Friday. The Chairman (Mr. Charles Hussey) and his colleagues, the Engineer and General Manager (Mr. J. W. Helps), and the Secretary (Mr. W. W. Topley) deserved all the good things said of them—for had they not since the last meeting with the proprietors obtained without a parliamentary contest, through friendly and diplomatic negotiation and agreement with the Local Authorities on sundry points, an Act which strengthens the position of the Company in an indefinable degree? and this important event followed upon the amicable settlement, without costly litigation, of their rating assessment disputes. In addition to the names quoted above, this reference to the success of the Company in connection with their Act and (previously) the rating appeals must not pass without mention of the inestimable services rendered in the settlement of both matters by Mr. Corbet Woodall and Mr. William Cash, F.C.A., in their capacities as Directors. Men may deride the idea of having directorates partly composed of members with special qualification and experience; but it would be vain for them to look for support, among many other places, to Croydon. However, the new Act was not the only matter upon which the proprietors had cause to congratulate the Board, their General Manager, and the Secretary. The consumption of gas in the half year showed, in comparison with the corresponding period of 1903, the excellent increase of little short of 10 per cent.; the dividend on the "C" stock was also advanced owing to a reduction of price in the Carshalton

district, with the prospect of a further addition at no very distant date; and, the opening (under the powers of the new Act) of a renewal fund account by £1000 notwithstanding, the carry-over was increased by a substantial sum. The future, too, is full of promise for both the Company and the consumers. The outdoor staff is being reorganized, and steps taken to develop the business in all directions; and there is every hope that the result will be very profitable to the Company. In these circumstances, congratulations between the Board and the proprietors were mutual and of the heartiest possible nature; and these were supplemented in a tangible way by the latter—the fees of the Directors and the salary of the Secretary being, before the end of the proceedings, brought into closer harmony with their responsibilites and work.

Irish Gas Managers and Local Quarterly Meetings.

We can sympathize with the aspiration of Mr. James Brodie, of Omagh, for a little more frequent intercourse with his fellow gas managers than is afforded by the Irish Gas Association. Since the Association expanded its wings, and, to the profit of all concerned, passed from the North of Ireland to what may be almost termed a national organization for the gas profession of Ireland, it has removed from it somewhat the homely feeling which attaches to an Association geographically restricted, and generally distinguished by the term "District." Of course, the status of the Irish Association has been heightened, and its value increased, by the enlargement of its territory and its possibilities in regard to membership and technical contribution. But the annual meeting leaves the whole of the rest of the year blank, as it were, in professional intercourse for the gas engineer and manager; and so something is wanted to supplement the annual meeting of the larger body. Mr. Brodie, in the letter in another column, therefore advocates as a start the formation of a District Association for the North of Ireland, which is the territory that gave birth to the now flourishing Irish Association. He is not alone in the feeling that it would be a good thing, and to the common advantage, for the gas engineers and managers of the district to meet together at more frequent intervals. We agree entirely with Mr. Brodie if he is not aspiring to introduce into the Association all the conventional methods of organizations of older standing and larger opportunities; and his letter seems to indicate that what he is suggesting is the institution of something of quite a simple character, because he says "there are many matters of importance to the manager of a small works upon which a profitable discussion might be held, but which, viewed in the light of an essay, would seem too trivial to be brought forward at the annual meeting." Ireland has not room for more than one full-blown Gas Association; but to meet the very natural desire of Mr. Brodie and others to have fairly frequent reunions, would it not be possible for the members of the Irish Association to form themselves into Sections, and hold (in addition to the ordinary annual meeting of the whole body) quarterly meetings for free and easy discussion, on matters appertaining to their everyday work? To further Mr. Brodie's suggestion, the columns of the "JOURNAL" will be open to our friends in Ireland for the discussion of the matter.

The Tale of Gas-Meter Testing.

In "London Statistics" for 1903-4, there is a little table which contains significance for the gas man—in fact, for all interested in the progress of the gas industry—and instruction for everybody who cares to note it. It shows the number of gas-meters tested in the establishments devoted to the purpose in various years between 1864 and 1903. Let us give the figures first. In 1864—just forty years ago—the number of meters tested was only 31,186; in 1868, 55,576; in 1878, 80,447; in 1888, 73,080; in 1898, 204,216; in 1899, 208,830; in 1900, 211,392; in 1901, 186,618; in 1902, 181,250; and in 1903, 186,198. This is a small but remarkably illustrative statement of the rise of the gas industry in the last four decades—from 31,186 meters forty years ago to 186,198 last year in the London district alone. And even the latter figure is not, be it observed, the highest of the period; but perhaps our electrical friends will read into the slight drop from 1900 a sign of a decline. The high figures of 1898, 1899, and 1900, however, may be taken as the years in which the demand for slot meters was at its greatest height; but, in the three subsequent years, the figures are remarkably well sustained, and are comparatively little less than those of the immediate four years when the meter makers were working at high pressure to meet the new-born demand. Of course, the foregoing figures do not include the meters tested by the City Corporation; the number which they dealt with in 1902 was 55,198. If there are any other interesting facts connected with these figures, we invite the meter-makers to our aid in publishing them. Perhaps, for instance, the figures would have been even larger, if an important factory had not been removed to one of the suburbs. The care that is taken in protecting the consumers is also illustrated by the fact that no less than 23,842 meters were rejected in 1902-3 as incorrect. In an earlier portion of the volume, a note on the subject states that during the year 25 incorrect indexes were discovered in the total number of meters tested. The amount of error in each case was very large—ranging from 60 per cent. in favour of the consumer to 150 per cent. in favour of the company. It is declared that a systematic method of testing indexes is impossible in London, as the Council have no powers for incurring expenditure for the purpose.

The Oxidation of Sulphur in Gas by Combustion.

The recent experiments of Mr. Otto Hehner, Dr. Rideal, and others, have invested with renewed interest a question which was discussed a quarter of a century ago by Mr. W. C. Young, F.I.C., F.C.S., and some other chemists—that is to say, Is sulphuric or sulphurous acid formed by the combustion of sulphur in gas? Attention has been called to the article which Mr. Young published in "The Analyst" about that time, and which was reprinted in the "JOURNAL" for Nov. 11, 1879 (p. 746). It is considered that this article completely answers the above question. Those readers who possess the number of the "JOURNAL" referred to will see that the results of the investigations there recorded are the continuation of others made by Mr. Young and contemporary investigators, and that the last paragraph of the article commences with the statement: "The results show beyond doubt that sulphurous acid only is formed when gas is burned in a bunsen burner under the Gas Referees' apparatus, as the small quantity condensed as sulphuric acid by water alone may reasonably be assumed to have been oxidized during its passage through the apparatus." It is of great value to have one's attention directed to published work of the past which has such a distinct bearing upon work of the present. Those who are interesting themselves in the results of the experiments on the effect of the combustion of gas containing sulphur on the air of a room, as laid before the Departmental Committee recently, will, we have no doubt, eagerly turn to these explorations of a long past day.

Municipal Gas Suppliers and their Officials.

It is not a little curious that the above subject lately engaged the attention of three municipal bodies almost simultaneously, and that the current issue of the "JOURNAL" contains reports of proceedings at two of them which have a singular bearing upon each other. It will be seen that the Ossett Town Council were recently exercised over the question of whether or not they should pay their Gas Manager an additional £50 per annum. It came before them on a recommendation of the Gas Committee, which we are sorry to find was not unanimous. However, it was submitted by the Chairman of the Committee with a certain amount of hope that it would be adopted, for the reason that Mr. Mottram, the gentleman in question, is said to be the lowest-paid Gas Engineer in the district, as he did not suppose the Corporation wished the Manager to give them the best years of his life and be underpaid. The proposition was cordially supported by several members, one of whom characterized Mr. Mottram as a very able officer, and a man of great ability, tact and courtesy. Indeed, this was generally acknowledged. The only thing that was not recognized was that these qualities were worth paying something extra for. One worthy councillor put it to his colleagues that if the Manager, as had been stated, had practically reconstructed the works without outside assistance—well, he had "gained experience at the expense of the ratepayers, and would be better equipped for the years to come." The Gas Workers' Union objected to the rates being burdened in order to advance salaries; though, of course, they would have cordially supported any rise of wages

among themselves, accompanied by shorter hours. On the whole, the Council thought the time was inopportune for making the increase; and they referred the recommendation back to the Committee. One speaker suggested making the amount £25. Whereupon another is reported to have declared that if he were in the Manager's position he would not take it. A similar case to this occurred at Carlisle, briefly noticed last week, where a proposal to raise the Engineer's salary by £100 per annum was met with an amendment to make it only £50. Here, however, the opponents were unsuccessful. We refrain from comment on these proceedings. All we will do is to quote, from the report in another column, Sir George Livesey's closing remarks on the occasion of his recent interview with the Bishop's Stortford District Council. Municipalities, he said, will not pay enough to get good men; and when they get a good one, they often treat him shabbily. "There is always trouble about increasing salaries. If an extra £50 is wanted, somebody opposes it, and it comes before the public in the papers, making it very unpleasant for the servants concerned." These remarks may be commended to the notice of the members of the two Municipal Councils specially concerned, and to others whose treatment of their responsible officials is similar to that here described.

Another Phase of Municipal Trading.

Many of our readers doubtless read in the daily papers early last week the account of the fire at the Shoreditch Town Hall. There is a curious feature about this disaster to which it may not be uninstructive to draw attention. Early last year, as the outcome of a conference of representatives of Local Authorities in London, convened by the Shoreditch Borough Council, a scheme was formulated to enable public bodies to insure against fire and other risks on the most favourable terms. The scheme was adversely criticized at the time; but it was persisted in, and it eventually took definite shape under the title of "Municipal Mutual Insurance, Limited." Of the various authorities represented at the conference, fifteen had signified their willingness to associate themselves with it, though the City Corporation, it is to be noted, were careful to keep clear. Every member of the organization undertakes to contribute to the assets, in the event of winding up during his membership, or within a year afterwards, for payment of the debts and liabilities contracted before he ceases to be a member, such amount not exceeding £10 as may be required. It appears that several Provincial Borough Councils were attracted by the scheme, and in due course joined the concern. Singularly enough, the first policy issued was granted to the Shoreditch Borough Council for the insurance of their Town Hall in a sum of £40,000; and the first serious claim falls under it, as the damage done to the building—at one time estimated at £20,000—is put down at between £5000 and £10,000. It is stated that the Company will only lose between £250 and £500, and that this will not absorb one-fourth of the reserve fund formed from the first year's profits. Besides, even if the whole of the fund were exhausted by a succession of calamities, the Company have, it is stated, further resources under a policy of insurance by a strong insurance company, which ensures the fund being sufficient to meet every loss falling upon it. Our contemporary the "Financial News" points out that the Company have another reserve—the power they possess, through the bodies composing the organization, of compelling competitors to contribute towards losses; so that if there were so many fires as to exhaust the funds, further losses would fall on the rates direct, and to these the various Insurance Companies would be compelled to contribute. If these Companes enjoyed the same power with regard to the Local Authorities, the position would be fair; but as it is, it is quite the reverse. It is thought in certain quarters that the early blow which this scheme has received will not improbably cause its disappearance from the insurance world.

Masonic.—We learn that the R.W. Provincial Grand Master of East Lancashire, Lord Stanley, M.P., will early in November consecrate the new Masonic Lodge, the "Northern Star." The lodge will meet at the Midland Hotel, Manchester. In this case, there is said to be probably the longest list of founders ever known for a lodge. The lodge will meet only four times each year, as is the case with the "Evening Star" lodge.

THE INTERNATIONAL GAS EXHIBITION AT EARL'S COURT.

For about three weeks now, the Directors and Committees of the gas undertakings of the United Kingdom have had before them communications soliciting their influence, interest, and support in making the forthcoming exhibition at Earl's Court the success that all having at heart the prosperity of the gas industry must desire. The results which have attended this appeal have, for the time which has elapsed since it was made, been of an encouraging nature to the Advisory Committee of the Institution of Gas Engineers; but it falls far short of what must be done, and what the Committee believe will be done, day by day, as Boards of Directors and Committees hold meetings at which the communications can be considered. We take this opportunity of asking those at the head of gas undertakings to let their replies be as early and as generous as possible; for the sooner the Advisory Committee know what they have at disposal the better, and the greater the amount of the support the more energetically and successfully will they be able to proceed to the work before them.

It may be there are Gas Directors and Committeemen who may argue with themselves that they have no power to dispose of funds for this purpose. To them, it may be said that "where there's a will, there's a way." There are others, too, who may be far removed from Earl's Court, who may excuse themselves with the thought that, through their geographical situation, they may not benefit from such an exhibition. It may be suggested to them that they are mistaken. For over 22 years now, there has not been a representative gas exhibition in this country—an exhibition which has been of sufficient importance to attract to it the eyes of the country through the Press and otherwise; and the time is now surely ripe, with the vast and far-reaching improvements in gas production and utilization of the past quarter-of-a-century, for an exhibition on the scale now projected. Though at Earl's Court the exhibition will be situated, it must be that its influence will extend to every corner of the country. All who have a part in the gas industry must share in the benefits and influence of the exhibition; all who will so share, should also share in its support.

Among our readers there are perhaps some who have not seen the circulars which were sent out by the Advisory Committee at the close of last month; and we therefore invite their attention to the following extracts. The first letter solicits the active sympathy and assistance of the members of the Institution of Gas Engineers. It is signed by the Chairman of the Advisory Committee (Mr. J. W. Helps), and reads:

The Advisory Committee appointed by the Council of the Institution of Gas Engineers desire to obtain the active sympathy and assistance of every member of the Institution for the performance of the arduous and responsible task laid upon them, of directing and co-operating with the organizers and managers of this exhibition, in order to make it worthy of the Institution and of the great industry to which we all belong.

The Committee are assured of your good wishes for the success of the exhibition, and the object of this communication is to acquaint you with what is being done, and to suggest how you personally may contribute towards the attainment of that high measure of success which the Committee hope to achieve.

You are already aware that the business part of the exhibition is being undertaken by two gentlemen of great experience in this particular class of commercial enterprise; the Council of the Institution being of the opinion that individual interest in the result, is the best guarantee of well-directed service in so highly specialized a department of modern trade. The Advisory Committee believe that this part of the enterprise is safe in the capable and experienced hands of Mr. F. W. Bridges and Mr. G. D. Smith.

The Committee ask you to exert your influence with all firms and others personally known to you, whom you have reason to believe could advantageously take part in the forthcoming exhibition, with the object of securing their countenance and support. Should you have any objects of historical or special interest suitable for a loan collection of articles illustrating the gas industry—of which it is desired to make a feature of the exhibition—they will be gratefully received and well cared for by the Committee.

It is of the *first importance* that there should be no misunderstanding as to who is responsible for the inception of this exhibition—the first of its kind since the Crystal Palace Electric and Gas Exhibition of 1882. It is promoted by the Institution of Gas Engineers, to illustrate the advance of the gas industry since that date, and is intended to convince the public that the industry was never so flourishing, nor so well adapted to the service of humanity in multifarious ways, as it is now. Will you, therefore, be so good as to spread the truth of the nature and scope of the exhibition wherever you can, and do whatever is in your power to help it forward, and give it that fully representative, illustrative, and educative character, which is more to be desired than any mere financial profit on the venture?

The circular sent to Chairmen of Boards of Directors and Committees contained the following paragraphs:—

The Advisory Committee appointed by the Institution of Gas Engineers to assist in the carrying out of this exhibition appeal to the proprietors of British gas undertakings for a fund, of moderate amount, to defray the necessary expenses of such features of the exhibition as will be of more benefit to the gas industry generally than remunerative to individual exhibitors.

The Committee desire to make this exhibition an object-lesson for the public as well as for architects, municipal engineers, and surveyors, and those who are interested in smoke prevention, and the improvement of the domestic arrangements of the people, in the manifold advantages of gas.

The exhibition will show, collected together and authenticated, the best methods of using gas for street lighting, the lighting of public halls, shops, and private dwellings, as well as all kinds of gas cookers and heating appliances, gas-engines, &c. It is also intended to show models of artisans' dwellings, as supplied with gas by the prepayment system, and by means of furnished apartments of all descriptions, to show what services gas can render to the professional man, the merchant, the shopkeeper, and the private resident. Cooking lectures and demonstrations will be arranged for and prizes offered for artistic gas-fittings of all kinds.

As there has been no international or really representative gas exhibition since 1882, and having regard to the great developments which have taken place in connection with the industry since that date, it is anticipated that there will be shown on this occasion a great number of important manufacturing appliances, machines, and processes using gas for various purposes. Opportunity will be afforded for making use of the exhibits for the instructon of engineering students. The exhibition will be registered under the Patent Acts for the encouragement of inventors, who will be invited to exhibit models and drawings of their inventions. Scientific and popular lectures will be given during the course of the exhibition.

The above are a few of the purposes for which the Committee are seeking funds, which will be expended only by their order.

The following scale of contributions has been deemed reasonable: For undertakings making under 50 million cubic feet per annum (say), £2 2s.; from 50 to 100 millions, £5 5s.; from 100 to 250 millions, £10 10s.; from 250 to 500 millions, £15 15s.; from 500 to 1000 millions, £21. For Companies making over 1000 millions per annum, the subscriptions to be at discretion.

From this circular (which is also signed by Mr. Helps) it will be seen that the Committee are not asking or expecting anything unreasonable in the way of subscriptions. We have no doubt, however, that contributions in excess of the foregoing scale from companies and municipal gas departments of a liberal disposition will not be declined by the Committee.

THE GAS AND WATER STOCK MARKET.

The Stock Exchange has had another regular "August" week; business being extremely limited in every department. The tendency was at no time strongly marked; and it was somewhat variable. At the beginning of the week, things were moderately cheerful, and prices slightly improved. Then they began to fall away; and by Thursday dulness ruled generally, except in the American Market. Next day there was a steadier tendency, though checked by the usual move to realize before a holiday; and on Saturday the Exchange was closed. In the Money Market, there was but a light demand, and the supply became superabundant, so that rates ruled easy, especially towards the close; but discount was steadier. Business in the Gas Market was showing signs of holiday time; the volume of transactions being decidedly shrunken. The general tendency was steady, and, had there only been a little more animation in the market, it might easily have taken a pronounced course upwards. The transactions at the meetings of gas companies all over the kingdom uniformly show the position of the industry not only to have been good in the first half of the year, but to present very fair promise of maintenance, and even further extension, in the immediate future. It is everywhere becoming apparent that the demand for gas for illumination, heating, and power is growing stronger and stronger. In Gaslight and Coke issues, there was a moderate array of dealings in the ordinary stock daily at nice, steady figures. The range of prices was never outside 93¼-94; and markings were mostly near the upper figure. Of the secured issues, the maximum and preference were rather active at good average prices. South Metropolitan was dealt in only to a limited extent, but was inclined to advance. The opening figure was 124, improving gradually to 125½ at the close. There was only one transaction in Commercials, at rather cheap figures. This was before the Company's meeting, at which the Chairman had a highly gratifying statement to lay before the proprietors. In the Suburban and Provincial group, there were a few transactions at only moderate prices; and Brentford consolidated was put down a point. In the Continental Companies there was rather more activity than of late. Imperial was done several times at medium figures, European was not touched, and Union had a fall—being marked once at 103. Among the more remote undertakings, there were several transactions in Buenos Ayres, River Plate, and San Paulo; while Monte Video had a rise. The Water Companies were depressed by the fall in value of Metropolitan water stock to a price below that which they had agreed to accept as the basis of calculation in their conversion into such stock; and New River had a fall of its own.

The daily movements were: On Tuesday, Continental Union fell 2. On Thursday, Monte Video rose ½. On Friday, Lea Bridge advanced 1; but Brentford consolidated fell 1. In Water, New River fell 10 on Monday. On Friday, still further reductions occurred.

"RADIANT."

Last week the world wondered, or such part of it as reads the "Daily Mail" and the papers that are guilty of copying the sensational tit-bits which that remarkable morning contemporary serves up to its readers. We stand among the guilty ones on this occasion. A new fuel had been discovered; and its marvellous attributes struck us as they did many others. Correspondents, believing that we were certain to know all about the matter, have asked for more information; but we have to confess to almost as much ignorance on the subject as they themselves possess. We may be pardoned for thinking that we know a little more about it than they, because for a whole week now there has been in our possession a chip of the substance which people are asked to believe, on most insufficient evidence, is going to revolutionize heating. On such slender evidence, we are not going to condemn; more knowledge is wanted before praising or consigning the material to that limbo from which many remarkable inventions of the genus ephemera never return. If the new material proves itself worthy of praise, it shall have our unstinted support; but we do say, and hope to be able to prove, that something more is at once required from the inventors to substantiate the claims which have been made with such a flourish, and certain of which claims—given to the world with such nakedness—ask too much of commonsense.

Before dealing more fully with the statements, we have an apology to offer to the inventors. The paragraph in last week's issue in which the new fuel was brought to the notice of the readers of the "Journal" was headed "Gas Threatened by a Wonderful New Fuel." This was a mistake, as the first claim of the inventors shows—"it [that is the fuel] gives treble the heat, *with the same gas consumption*, as an ordinary gas-fire." "Radiant" does not threaten gas; its object is to aid it. The new fuel, in short, is intended to replace the fire-clay balls, the asbestos, the iron frets, and so forth at present used in gas-fires; and, by the higher efficiency (so claimed) which will ensue from its use, to enable gas-fires to be the most economical means of heating extant. Of course—assuming this is correct—it will mean the popularizing of gas as a heating agent to a far greater extent than has hitherto been possible, and consequently the increased consumption of gas; the only rivalry "Radiant" will offer being to other types of fuel. We may, therefore, rest undisturbed, and wish and hope that all the good things said of this new discovery will turn out true.

Meantime, we cannot shake off a little incredulous feeling. As already stated, the sample of material sent to us is but a chip; and we are asked to state, on this limited supply, "if the fuel acts as stated by the inventors when placed in a bunsen burner." We must decline the invitation. It is declared in claim 5 (as published last week) that the material is as cheap as fire-clay, and is inexhaustible. This being so, it is impossible to understand the niggardliness of the inventors in not submitting sufficient for the purpose of making a thorough and proper test. We suggest to them that they send sufficient for the supply of any ordinary gas-fire; and it shall be submitted to tests, under comparable conditions, with a gas-fire of similar size supplied with ball fuel. Then we shall be pleased to publish the results of the test. This is a fair offer; and it is to be hoped the inventors will take advantage of it. It is only right to say at once, as bearing upon this, that a further communication has been received from them in which they say: "We have had the fuel in a gas-fire burning for over three months; and the fire blazes away now more fiercely than ever. We also submitted the fuel to one of the smartest and up-to-date chemists and metallurgists we know of, who was on a visit to the firm we are connected with (a man having a large experience in geology and mining, in addition to chemical research); and he was so surprised at the tests he made, that he has decided to throw in his lot with us."

As to the nature of the fuel, we can supply no information beyond this, that it is a combination of metals, is made from materials now the waste products of chemical works, is inexhaustible, is patented, and has a registered trade mark. Being patented, application was made to the inventors for a copy of the specification. But it will not be published for some months yet; and they very properly say that, until the foreign patents are completed, it would be injudicious to make it public. Therefore, those who are anxious for further particulars must possess their souls for a time in patience.

This leaves for consideration one or two points arising out of the claims. These, published last week, are:

(1) That the fuel gives treble the heat with the same gas consumption as an ordinary gas-fire.
(2) That it takes up the carbonic oxide from the air, and purifies the atmosphere.
(3) That it does away with the unpleasant smell given off by gas-fires.
(4) That it burns brightly like a coal fire.
(5) That it is as cheap as fire-clay, and is inexhaustible.

Perhaps it will be well to give in conjunction with these claims an extract from an explanatory letter received from the inventors, as we must confess that, in part (explanatory though it is intended to be) we do not entirely understand it. It is as follows:—

You will find that, as soon as the fuel gets hot, it will give off a gas burning with a bright peach-coloured flame, instead of the blue flame

characteristic of the bunsen burner. The explanation is that the fuel absorbs carbonic oxide from the air in the same way as a plant, retaining the carbon (to replace that which is burnt) and liberating the oxygen; at the same time giving out intense heat. As you are probably aware, nitrogen only combines with carbon at an intense heat, forming cyanogen gas. This accounts for the peach-coloured flame. The fuel does not burn away (simply because it does not burn, merely sets up a chemical reaction), but, when hot, is absorbing carbonic oxide from the atmosphere and giving out oxygen. There is nothing remarkable in the facts. It is merely a practical demonstration of the axiom that "nothing is lost or destroyed." The air consists of four-fifths nitrogen; and this fact is generally lost sight of when air is induced through a bunsen burner. The gas that is burning is a mixture of carbonic oxide and nitrogen (at least we set out with the intention of making these gases burn, and, as far as seeing and feeling is concerned as a proof, we have succeeded)—gases that at present are allowed to run to waste, and pollute the atmosphere.

This is not very lucid; and as we do not quite grasp what the writers are driving at, it cannot be fully discussed. They say there is nothing remarkable in the facts; but our opinion is that there is much that is remarkable. To go back to the claims as originally stated. The first one is that the material gives treble the heat, with the same gas consumption, as an ordinary gas-fire. The point cannot be upheld or questioned, as there has not yet been an opportunity afforded of determining its accuracy or otherwise; but it will be interesting to know whether the comparison is made with a ball-fuel fire or one fitted with iron frets. Fancy prefers the ball fuel; but it is almost a generally acknowledged fact that there has not yet been a ball fuel put on to the market that can compare with the old iron frets for heating efficiency. The next point is that it takes up the carbonic oxide from the air; and there is no mistake that the inventors believe this, as they again say, in their explanatory letter, "the fuel absorbs the carbonic oxide from the air in the same way as a plant." Now our inventors seem to have made a little jumble here as to what this remarkable fuel will do. Carbonic oxide is a deadly poison; and may we be defended from ever having to live in an atmosphere that contains it even with the partly compensating pleasure before us of being in a position to use a fuel which will give treble the heat of an existing gas-fire, and which will kindly draw to it the poisonous carbonic oxide. Our Roscoe, our Geikie, and the other authorities at command do not inform us that carbonic oxide is a constituent of the atmosphere; and we are quite sure that the Creator of man would not have provided an atmosphere with a constituent in it to poison him. Admitting that it may exist in places as an impurity, how will the fuel get on where it does not exist? Moreover, self-respecting plants we were always taught mainly live on carbonic acid—not carbonic oxide. However, assuming that there is the carbonic oxide in the air for the fuel to absorb, the latter has, we are informed, the redeeming feature that it liberates oxygen. This is good, but astounding. The flame which heats the fuel asks of the air oxygen to support combustion; the "Radiant" gives back to the air the oxygen—maybe in part or wholly—which the flame has taken away! We are not denying that the inventors are right here, because wonders will never cease.

With the little chip of the fuel submitted, a bunsen flame has been made peach-coloured. It is hardly fair to criticize the material on the experiences of a mite such as this, because it may or may not be a fair sample of the bulk. It will, however, show the inventors the danger of relying upon a good character for the fuel on an insignificant morsel when we tell them that, in the bunsen flame to which this piece was exposed, only the edges were made brightly incandescent, and that, after leaving the flame, the edges crumbled away. If the material is all as friable as the specimen sent (it is sincerely trusted that it is not), the nuisance it will create in a gas-fire will not make it a popular substitute for the existing fuels.

We will not go any further to-day; but really the inventors must reconsider their statements, and see whether they have correctly enlightened the world as to the chemical and other virtues of their fuel. If so, it is the fuel that gas-fire makers have been looking for for years; and the inventors have a bright prospect before them. They, however, will not be thanked by gas-fire makers or the gas industry generally for allowing it to go forth that, without their fuel, there is an unpleasant smell given off by gas-fires, They must surely have based their judgment on one improperly fitted. There is nothing more to be said about the material just now; but, if our offer of thoroughly testing it is accepted, the inventors may rely upon the results being faithfully recorded. "Chemical reactions," carbonic oxide, and the liberation of oxygen will not enter into the inquiry; it shall be a practical test of the heating property of the fuel.

THE WEST HAM TESTING CLAUSE.

An award of some importance to the West Ham Gas Company was issued last week by Mr. C. Vernon Boys, who, by an agreement dated June 14, between the Corporation of West Ham and the Gas Company, was appointed Arbitrator with regard to a difference which had arisen between the parties as to the method to be adopted for the purpose of testing for illuminating power. Section 31 of the Company's Act of 1902 states that: "On and as from Jan. 1, 1903, section 27 of the Act of 1889 shall be read and construed as if the word 'fourteen' had been inserted therein instead of the word 'sixteen;' and in making tests for illuminating power, the gas shall be burned at such rate as to yield the maximum light for which the burner for the time being used in making such tests shall be designed." It was left to Mr. Boys to determine the true construction of this section, having regard to the provisions of section 25 of the Company's Act of 1889. The latter section was to the effect that the apparatus to be used for the purpose of testing the gas, and the mode of making the tests (excepting that the testing for illuminating power should be made at intervals of not less than half an hour each) should be such as should from time to time be prescribed by the Referees for testing the gas supplied within the Metropolis.

The use of the word "designed," rather than "capable," in section 31 of the Act of 1902 appears to have been unfortunate. In order to get the "best result," the Company wanted the gas tested with an 18-candle flame; but inasmuch as to do this necessitated moving the position of the burner on the photometer, it was suggested that the "Brentford" burner for 14-candle gas (which gives much about the same result) should be used. Accordingly, the Company placed one of these burners on the photometer. Mr. W. C. Young (who tests the gas for the Corporation), however, objected; his contention being that the burner was designed for 16-candle gas. The Solicitor to the Corporation thereupon wrote to the Company asking them to remove the 14-candle "Brentford" burner, and replace it with the Referees' burner. This they did; but at the same time they pointed out that the existing state of things was unsatisfactory, as, if the illuminating power of the gas was returned at below 14 candles, the Company would object on the ground that they were not getting the advantage to which they were entitled under the Act of 1902. Under these circumstances, it was agreed to ask the Referees to define the clause dealing with the matter. They as a body declined; but Mr. Boys personally consented to do so, on condition that both sides would be strictly bound by his decision.

Mr. Boys' award is to the effect that, in making tests for illuminating power, the apparatus prescribed from time to time by the Referees shall be employed, and that the chimney and the standard burner prescribed by them from time to time for testing gas which is required to have an illuminating power of 14 candles shall be used, and that the gas shall be burned at such a rate as to give a light of 18 candles; but if, owing to any change in the manufacture of the gas, or from any other cause, the flame giving a light of 18 candles should be more than 4 inches in height, or it should become impossible to obtain a flame giving a light of 18 candles with the burner and chimney prescribed by the Referees for 14-candle gas, the gas shall be burned so as to give a light of 16 candles. He further directs that, in determining the illuminating power of the gas, in accordance with section 25 of the Act of 1889, the mode described in the notification of the Gas Referees from time to time shall be followed, with the alterations in distances and in the calculating table (when the gas is being burned at such a rate as to give a light of 18 candles) which he sets forth in his award.

The Company have thus the satisfaction of finding their reading of the clause endorsed by Mr. Boys in his decision.

ELECTRIC LIGHTING MEMORANDA.

An Examination of London Electricity Accounts—Popularizing Electricity in Leeds—The Insurance of Electrical Machinery.

The fourteenth volume of "London Statistics"—1903-4—has been recently issued by the London County Council. It is a mighty tome, running to some 807 foolscap pages full of statistics—typifying by bulk, variety, and individual magnitude what a wonderful place is this London of ours. There is one section of the statistics which informs us on the subject of electricity supply. It is seen that the responsibility for this reposes in thirteen Borough Councils and sixteen Companies; and yet, though these numbers look so formidable and represent a considerable amount of energy of two kinds, with the exception of the temporary small percentage backslidings in consumption of the Gaslight and Coke Company (which have now apparently ceased), electricity has not prevented the Metropolitan Gas Companies year by year capturing good additions to business. The electrical statistics are deficient in several respects; but there are many points about them which are of interest. In the first place, it is observed that the capacity of the plant possessed by the Companies is far in excess of that under the control of the Borough Councils—being equal to 94,045 kilowatts, as compared with 27,644 kilowatts for the latter. It is rather amusing to see how, though a change of policy is coming over this state of things now, the Borough Councils have favoured street lighting by electricity where the undertakings are their own property. In the case of the Borough Councils, out of the total number of units of electricity they sold in the year to which the returns have reference—viz., 21,814,306 units—no less than 5,721,093 units were used for street lighting; while out of a total sale of 74,554,163 units by the Companies, only 3,259,749 units were taken for public lighting. Just remark the difference in proportion; but do not think we are complaining.

Looking next at the average price charged per unit for private supply, the Borough Councils show a slight advantage over the Companies—their average being 3·74d. per unit, as against 4·40d. by the Companies. But, on the other hand, the Companies were only paid an average of 2·11d. per unit for the electricity consumed for public lighting; while the Borough Councils charged up an average of 2·40d., which looks very much like favouring the private consumers at the expense of the general body of ratepayers who have to pay for the public lighting. The difference, true, is only 0·29d. per unit, but multiply that by 5,721,093 units! The point we have already made in connection with the units sold crops out again in the revenue account. In the case of the Borough Councils, a sum of £71,124 for public lighting stands in relation to £250,821 for private consumption; while in the case of the Companies the comparatively insignificant sum of £36,761 for public lighting stands in relation to £1,305,915 for private consumption. With regard to the expenditure, on generation and maintenance per unit sold, it works out to 1·86d. for the Local Authorities; and 1·89d. for the Companies. While the total expenditure for the former was £193,909 (2·13d. per unit sold), as compared with, for the larger business of the Companies, £706,535 (2·27d. per unit sold). Four of the Borough Councils are found requiring sums ranging from £730 to £4205 from the rates; while of the remainder five showed balances reduced by considerable sums in the year under notice, and only three made additions to their balances. Again, only three Borough Councils carried anything to the depreciation fund or wrote anything off capital expenditure; while a round dozen of the Companies made substantial provision in this respect—the total for the Councils being £2371, against £136,948 for the Companies. We need not comment on figures such as these; they carry their lessons on the surface.

The Electricity Department of Leeds are trying to popularize electricity among small householders. To a point, they have met with success, for the permanence of which, however, we rather fear. Since the beginning of this year, about 500 new customers have been connected. There is nothing very astounding about this for such a city; nor is it startling to find that the majority of these new installations are in houses letting at a rental of under £25 per annum, and in a few isolated cases in cottages letting at from £16 to £18 per annum. If it is true that the increase of the department's business so far this year is only as stated, and that the majority of the increase is of such a small order, then all we can say is so much the worse for the department. In the bulk, such an accretion as this will not make much difference in the aspect of the annual accounts. Of course, the future may see a further big addition to the patronage of the department by the small householder, in view of the fact that the landlords who are now developing one or two large estates are both wiring and piping up their houses so that the incoming tenants may take their choice of electricity or gas. This is fair to the tenants, who ought not to be left, as they are through the present-day practices of some landlords, only Hobson's choice in the matter of convenient artificial illumination. The electrical cocks of Leeds have been crowing loudly over their success in getting electricity into these lower-class houses; but we should advise them to reserve their crowing until they see that electricity has been firmly established in that direction. This cannot be determined for (say) twelve months or so, by which time the new consumers with slender purses will have had an opportunity of fully judging whether the extra outlay is worth the fancy method of lighting.

One of the Leeds papers, in bolstering up the new enterprise with a little wordy twaddle, informs its readers that "if the householder is content with a somewhat similar illuminating power to that which he would obtain from gas, and is careful to switch it off when not required, the increased cost is *said to be* but trifling," which shows how much the writer knows about it. Mr. A. E. Collett, who is a plumber and gas and electricity fitter, and is as willing to do one class of business as the other, has—being a user of both systems—sent a useful letter to the paper in question, in which he shows, by calculation, the absurdity of the statement quoted. He states that, from his experience, the cost of lighting a room by electricity with three 16-candle power lamps, for 1000 hours per annum, would amount to £3 7s. 6d., against 12s. for a 60 to 70 candle power incandescent gas-light. The charge for electricity in Leeds is, we believe, now 4d. per unit, so that it must be brought down to about 1d. per unit before it can compete with incandescent gas-light; and therefore we fear for the continuance of the success over which there has been so much bluster. The Electricity Department of Leeds are no doubt being helped, as are the Departments in some other towns, by the canvassers of firms who are interested in electrical fittings only, and who are often in the habit of making statements as to the cost of electric lighting that the duped consumers find are not substantiated in the result. The switching off of electricity, and the other little hints to economy, may be practised for a time. People, however, do not like living in a house dead and dark, when for the cost of lighting one room by the electrical system, they can distribute a few incandescent gas-lights through a house, and so displace cheerlessness by cheerfulness. Prophet though the editorial writer in our Leeds contemporary may believe himself to be, we cannot, under existing circumstances, subscribe to his dogmatic declaration that "the time is not far distant when electric light will be found in the houses of even the very poor."

The insurance of electrical machinery has been for the Companies engaged in that class of business of a rather more hazardous character than obtains with machinery of other types; one reason, of course, being that it was only some years of experience that could enable them to lay down safe conditions for their own protection, and to make this class of business lucrative. Some little insight into this matter, and support for the foregoing statements, are found in the annual report of the Chief Engineer of the Engine, Boiler, and Employers' Liability Insurance Company, Limited. Of late years, the electrical branch of the Company's business has shown some remarkable activity—the increase in 1903 alone was at the rate of no less than 34 per cent. Unfortunately, however, for the Company, the number of breakdowns has increased in almost the same proportion. This denotes an unreliability which cannot tend to the happiness of the users and those in charge of electrical machinery. It also shows the difficulty that the Insurance Companies must have had in determining suitable rates of premiums, as guiding data a few years ago were almost entirely absent. The cost of boiler inspection furnished some clue to the probable cost of inspection; the published returns of the electric lighting companies fixed outside limits to the probable cost of repairs; and the cost of rewinding armatures of various sizes could be approximately ascertained. But rates for breakdowns among dynamos and motors, continuous-current machines and alternators, and the differences of risk in various trades were but a few years ago almost entirely unknown. Something like a guess had then to be made to fix a scale of risks; but the experience of the past few years has convinced the Company mentioned that they made a very fair computation in settling their scale. However, there is another point in the report which suggests that repairing electrical machinery is no insignificant matter, and that really little repairs cannot always be dealt with locally, but necessitate the sending of machines to the makers. In the case of even small machines, the Company find that the cost of carriage bears a no inconsiderable proportion to the cost of the repairs for breakdowns; for, "in many parts of the country, it is better to send the damaged machines direct to the makers than to have them repaired locally." For these and other reasons, the Company have had to make certain increases in their rates for the smaller machines; and for quite a different reason—an excessive rate of breakdowns—considerable additions have had to be made to the premiums charged for motors driving coal-cutters underground. It has become evident that, when a little more experience has been gained, a more elaborate classification of rates will be advisable, differentiating between dynamos and motors, and between machines of the same kind according to age, design with reference to facility for repairs, and to the nature of the trades in which they may be used. Knowledge of these matters may be of use to gas engineers in connection with the local competition of electricity with gas for power purposes.

GAS-ENGINE ACCIDENTS.

FAILURES have their educational value. This has been observed and acknowledged time and again. They mark the pitfalls and dangers which beset human endeavour and action; and therefore show us what to avoid. They also point out where improvement is required; and oftentimes they are the direct means of producing what is needed, through the stimulus which they have upon ingenuity. It is because of the recognition of this value that we derive pleasure in perusing the annual report of the Chief Engineer of the Engine, Boiler, and Employers' Liability Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.). The report is not an ordinary one, simply composed of dry statistical matter, threaded together in a slipshod fashion. It is a report extending to little short of 100 pages, with the hand of the technician visible in every one; and for engineers in every department the compilation sheds light and interest. Of course, the business of the Company is essentially one in which it is necessary to keep a watchful eye on all that exists in the lines along which they do business, and on all new development—good or otherwise; and this necessitates the employment of technically qualified men in all departments, acting under the one chief. It is as much part of the Company's business—being to their financial interest—to prevent accidents in connection with machinery as to guarantee those who patronize them against financial loss in the event of accidents. Looked at in all these lights. it will be seen that Mr. Longridge is in a peculiarly favourable position for interesting annually all concerned in engines, boilers, and electrical machinery of every kind.

It is impossible to review here the whole of this substantial report; and therefore, in addition to a little general information, we must confine ourselves to the section dealing with gas-engines. In the first place, the breakdowns of steam, oil, and gas-engines dealt with during the year may be classified as follows:—

	Steam Engines. Per Cent.	Gas and Oil Engines. Per Cent.
Due to accidents or causes unascertained	31	29
,, negligence of owners or attendants	18	32
,, old defects or wear	30	14
,, weakness, faulty design, or bad workmanship	21	25
	100	100

We should like to prevail upon Mr. Longridge to distinguish between the gas and oil engines in future reports, because we do not like to see some of the percentages given in the second column, and should prefer to bring them a little nearer home. However, a useful portion of the report is that in which he indicates the particular parts of the engines which appeared by their failures to have caused the breakdowns, or (where damage was due to accident or to something outside the engine) the parts which seemed to have broken first. In the gas and oil engines, these were: Valves and valve gear, 29; cylinders, cylinder ends, and covers, 22; connecting-rods, 13; pistons, 8; main-shafts, 6; governors and governor gear, 6; fly-wheels, 6; bolts,* 6; bed-plates and pedestals, 4; silencing-boxes and exhaust-pipes, 2; and main driving-belts, 1—total, 103.

A great number of examples of breakdowns of engines, boilers, and electrical machinery are given; and it is from these that the lessons of the failures must be drawn. There is a case of a horizontal single-cylinder gas-engine, with cylinder 14½ inches diameter by 22-inch stroke, and a speed of 170 revolutions per minute. In this instance, the engine was stopped by water leaking into the cylinder. The end containing the valves was found to be cracked near the exhaust-valve, and a new end was required. The cause of the accident was overheating, resulting from an accumulation of deposit in the water-jacket. It seems that four other cases of the same kind occurred during the year. Indeed, in some localities, the accumulation of deposit in the water-jackets of gas-engines is a very serious difficulty. It is now being met to some extent by the provision of hand-holes for cleaning; but there are, unfortunately, a large number of engines without them. Then it is found that four other cylinder ends were cracked sufficiently to require replacement without any apparent cause, save the unequal expansion by heat of the outer and inner surfaces of the jackets. This is a difficulty that can only be overcome by finding, from experience, suitable forms and mixtures of metal for the cylinder ends. During the year, in one case only was a water-jacket cracked by frost.

Another interesting example is that of a horizontal blowing engine, of 750-horse power, driven by blast-furnace waste gases. The gas-cylinder in this instance was 51¾ inches diameter; the blowing-cylinder, 70 inches diameter; the stroke of the pistons, 55 inches; and the speed, 80 revolutions per minute. The gas-cylinder, piston, and piston-rod were all water-jacketed. After the engine had been at work a few weeks, the piston cracked, probably owing to the unequal expansion of the faces exposed to the flame and to the air. It was replaced by another of the same design, which also cracked in a similar way after running a few weeks. The third piston has been made of somewhat different design, and has now been working for some months. The designing of large pistons capable of withstanding the pressures and temperatures existing in the cylinders of gas-engines for any length of time is likely to prove, in Mr. Longridge's opinion, no easy task—particularly where the engines are horizontal, as the uniform distribution of the cooling water over the whole surface of the piston appears to be more difficult than when they are vertical.

The third and last illustration taken is that of a horizontal gas-engine, with cylinder 11 inches diameter by 21-inch stroke, and a speed of 200 revolutions per minute. The big end of the connecting-rod was fitted with a cap, secured by two bolts, each ¾ inch diameter, after the marine fashion. One or both of these bolts broke while the engine was running, causing wholesale injury—breaking the piston, cylinder liner, and framing, bending the connecting-rod, and doing minor damage. Eleven other engines broke down during the year from the same cause. These accidents seem to suggest that the bolts in the big ends of the connecting-rods of gas-engines are too weak. In determining their dimensions, Mr. Longridge urges that it should be remembered, besides the ordinary stresses put upon them in overcoming the inertia of the moving parts at the end of the exhaust and beginning of the suction strokes, considerable extraordinary stresses may be produced by the pistons getting gripped by the cylinders either from overheating or want of lubrication. Moreover, when the brasses get worn, and the bolts slack, a certain amount of cross-bending stress may be thrown on the bolts.

Another somewhat weak point in the design or construction of the smaller size of gas-engine appears, from Mr. Longridge's experiences, to be the fitting of the fly-wheels. During the year, the fly-wheels of six engines cracked through the bosses; the cracks in all cases starting from the corners of the key-ways. As the wheels generally have to be put on to the shafts after the engines have been erected at the purchaser's works, there is some difficulty in making them a very tight fit, so long as they are cast with solid bosses; and therefore, as a rule, they depend entirely upon the keys. It is questioned whether the fitting of these keys receives as much attention as it requires. In some cases it certainly does not. The strain upon the fly-wheel of a gas-engine, it is pointed out, is much greater than on that of a steam-engine; and to make a wheel secure by one sunk key requires really first-class workmanship. The crank-shafts of gas-engines have been materially strengthened of late years; and only three breakages are reported among the engines inspected last year. There are still, however, some weak shafts being made; and the insurance of several engines has had to be declined on account of them.

* These do not include bolts in pistons, connecting-rods, or in the moving parts of the valve gear; bolts in these parts being included with the parts themselves.

CONDENSATION—A DEVELOPMENT.

By A. F. Browne.

[Noticing recently that Mr. A. F. Browne, the Engineer of the Vauxhall works of the South Metropolitan Gas Company, had been making application for a patent, in conjunction with Mr. Dean Chandler, for "Improvements in and relating to Condensing and Cooling Gases, Vapours, and Liquids," the former gentleman was invited to favour his professional brethren, through the medium of the "Journal," with particulars as to the arrangement proposed and the results so far obtained. Mr. Browne was good enough to comply, and has submitted the following interesting article and illustrations, giving a general idea of the form the apparatus would take when erected for practical use. In another column of the "Journal" to-day (p. 530), we give an abstract of the patent specification, with the drawings that accompany it.]

The question of the feasibility of employing the fan as an aid to condensation seems to have been raised shortly after the introduction of this piece of apparatus to gas-works; but such anticipations do not appear to have been realized,

The writer recalls a suggestion of his own, to the effect that condensers should be placed in subways and subjected to fan-draught. It was a crude and mistaken proposal, because the very fact that artificial currents must be confined or contained, largely discounts their value for cooling purposes, and fully accounts for the non-employment of the fan in this direction. This has been unfortunate, because there has existed for some years a demand for a modification of the atmospheric condenser, which—by means of a current, and possibly a cooled current—would give greater control of the apparatus and a higher duty per unit of surface. That the air-current difficulty is real will not be disputed; but it may be well to state the case at length, and this may be most effectively done by contrasting the efficiency of natural currents and artificial currents as cooling agents.

A condenser erected in the open air and, let us assume, not in immediate proximity to buildings, is subject to air temperatures which must at any moment be practically uniform and identical at any point or section of the apparatus. For it may fairly be argued that the greater heat imparted to the cooling medium or agent by contact with the hotter surfaces, is compsensated by the greater speed of the resulting currents of rarefied air. Therefore, the greatest difference in temperature between the cooling agent and the hot bodies exists, and is continuously available where the surfaces are hottest, with the result that the ordinary atmospheric condenser—though usually subject to every variation of the weather—is on the whole efficient and satisfactory at the hot extremity, or gas inlet end of the apparatus, though its efficiency falls very rapidly as the gas cools. The substitution of an artificial, and therefore an enclosed or contained, air current is followed by very different results.

It is assumed that, for reasons of economy, the air is introduced to the building, or envelope, surrounding the condenser, or to the conduit or conduits traversing it at its cold extremity or gas-outlet end. The air travels over or through the apparatus, it rises in temperature; it expands, until (upon arriving at the hot extremity) its temperature so closely approximates to that of the hot bodies that the condenser is robbed of its efficiency precisely at the point where, under conditions of natural air current, such efficiency would be at its maximum—a loss which must certainly be compensated by larger volumes of air, with a corresponding expenditure of power, and which will probably necessitate larger surface of the apparatus.

This is bad enough; but there is more, if not worse, to follow. An enclosed air current passing over the external surfaces of a condenser is attended with loss of an even more important natural advantage, which in the case of the exposed condenser disposes of some 58 per cent., of the heat—viz., radiation to space.

If, for purposes of such a current, a condenser is enclosed in a building, it follows that radiant heat is intercepted by the walls, which either absorb it or reflect it back to the condenser surfaces, with the result that both walls and surfaces can only be cooled by contact of the current, which is therefore saddled with the total load instead of the 42 per cent.—the duty of the atmospheric condenser in the open—so far as air contact is concerned.

It may be objected that nobody would surround his condenser with a bad conductor of heat. Quite so! But what follows if a good conductor be employed? Obviously, the necessity of shielding the envelope, or shell, of good conductivity from the rays of the sun—say, by means of an open shed with suitable air uptakes, as, in fact, condensers of all types should be shielded.

It having now been shown that for purposes of the artificial air current a fan, a shell, and a shed are required, the question may fairly be raised whether the ordinary air condenser working under natural air draught would not prove quite as efficient, if not

indeed far more so? If the foregoing arguments are soundly based, the conclusions follow—

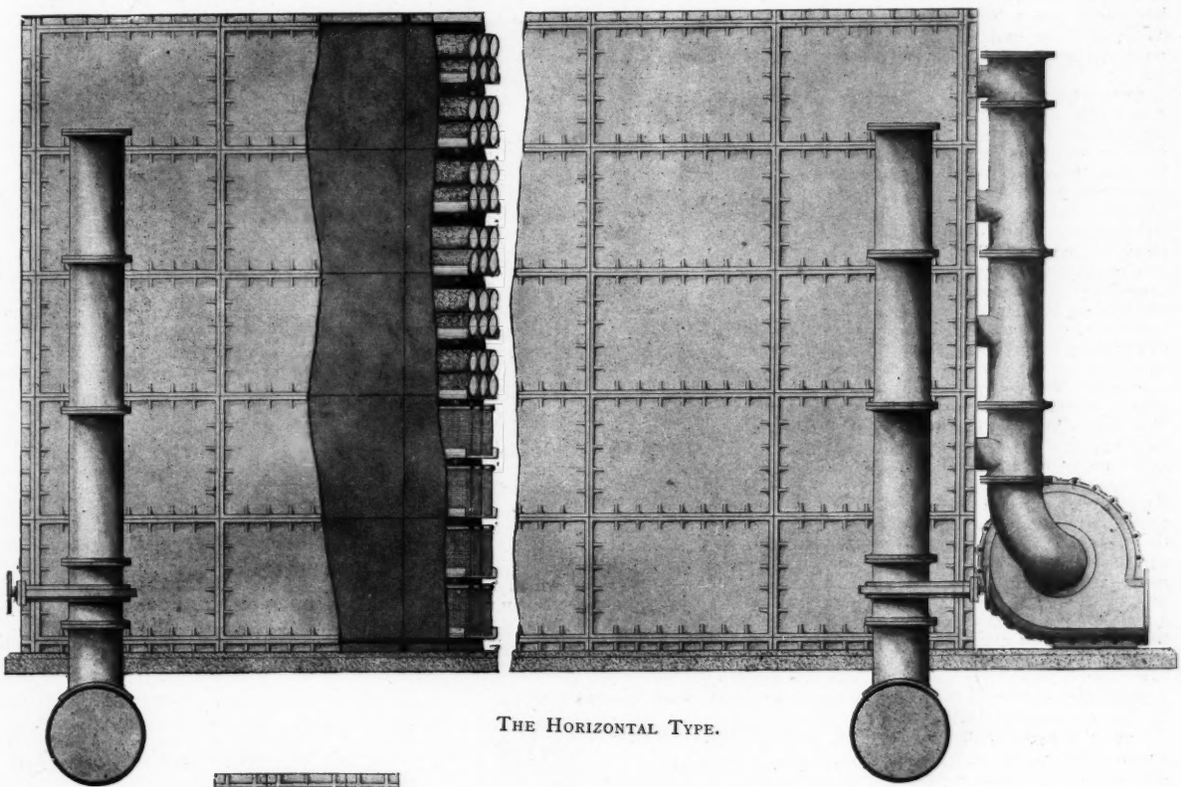
1. That for purposes of cooling hot bodies, a confined air current acting upon the external surfaces of a condenser is inefficient and extravagant.

2. That even if taken through, or contained within, the condenser, the efficiency of an artificial air current is not comparable with that of natural currents, or (so-called) still air, in contact with the external surfaces of an outdoor, though shielded, condenser.

In a paper, upon "Condensation," read before the Institution of Gas Engineers in 1902, the writer alluded to certain experiments which had aimed at cooling large volumes of air by causing such air to evaporate water to the point of complete saturation—the natural saturation, or hygrometric condition of the atmosphere varying normally between 50 and 70 per cent. These experiments were subsequently continued and the previous results confirmed. They went to show that the average hygrometric state of the atmosphere gives so small a margin to work upon—*i.e.*, is capable of evaporating so small an additional volume of water in bringing about complete saturation—that the possible reduction in temperature to be effected by causing the air to absorb the balance of moisture amounts to but few degrees Fahrenheit while these comparatively trifling possibilities are, not seldom, discounted by variation between the air temperature and the water temperature of the day.

On the whole, therefore, the results of experiments designed to cool large volumes of air below the temperature of the day by enforced completion of aqueous saturation, seemed either too trivial or else too uncertain to be of any practical advantage in condensation.

These theoretical and experimental conclusions having been



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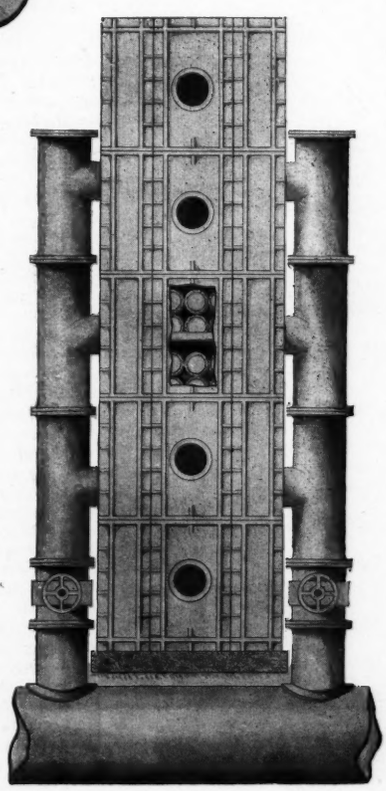
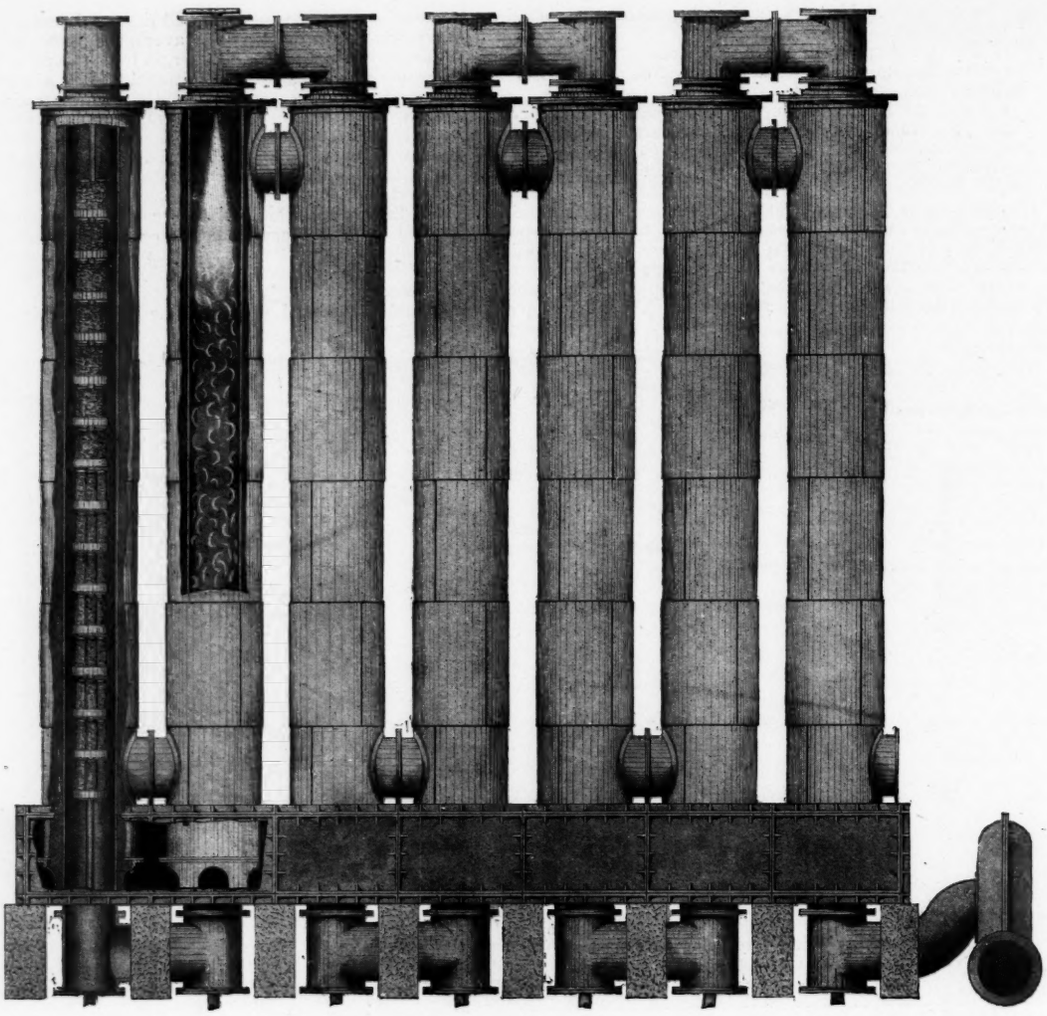


reached, there appeared to be no probability of bringing about the desired improvement of the atmospheric condenser from the standpoints of control and surface efficiency. The writer, nevertheless, kept an open mind on the subject, and some eighteen months ago a new idea rose to the surface. It was this: "Why not saturate the air during its passage through the condenser, and thus refrigerate the heated air *in situ*?"

The idea offered new ground for experimental research, and apparatus was designed upon the following lines: The condenser was not to be enclosed, and would therefore conserve the natural advantages of radiation and air contact attaching to the ordinary forms of the atmospheric condenser. An internal duct or conduit was to be provided, through which a current of air was to be drawn by a fan. The air was to be admitted to the conduit at the temperature of the day, and was to be drawn in the opposite direction to that of the gas current. To the heated and expanded air as it travelled through the duct, it was proposed to introduce water in the manner best suited to its rapid and continuous evaporation.

The alternative ideas of enforced and of automatic saturation having ultimately emerged, means had to be devised to present the water to the air in accordance with each of these theories. To achieve enforced saturation, it was proposed to heat the air in its passage through the conduit (say) some 20° Fahr. above the temperature of the day; and then to subject it to a mist or fog of atomized water, by which it was expected to be saturated and therefore cooled as it were *per saltum* about midway of its passage through the condenser.

This saturated air and any mechanically suspended water which had not been vaporized, was then expected to rise again in temperature in its passage through the second half of the condenser, and to attain at the air outlet or hot extremity of the apparatus a temperature nearly identical with that of the inlet gas. The specific heat of water being so much higher than that of air, it seemed to follow that the presence of any superabundant fog would be an advantage.



THE VERTICAL TYPE.

To effect automatic saturation, the means devised were the following: The water was to be distributed throughout the conduit from end to end—viz., from the air inlet to the air outlet, in shallow trays. Partly immersed in these trays were to be absorbent materials of cotton fabric, carried on wire-netting or suitably suspended, which by capillary attraction should offer ample wetted surface to the air, in order that the air as it gradually rose in temperature might gradually evaporate the water. By the adoption of these means, it was thought that the process of saturation would be both gradual and continuous.

An experimental apparatus having been erected, and these questions having been put upon a working scale which dealt with some 48,000 cubic feet of gas per hour, it was at once evident that a powerful means and method for the improvement of the air condenser had been devised; the reduction in the temperature both of the air and of the gas consequent upon evaporation of the water, being remarkable. [See the accompanying tables of results obtained—pp. 525-6.]

But analysis revealed the startling fact that in no experiment had complete aqueous saturation been effected, nor anything approaching it. The observers were greatly taken aback by this discovery. They knew, approximately, the number of heat units to be removed from a known volume of gas at a temperature of (say) 140° Fahr. They had calculated the weight of water which, by process of evaporation, would absorb these units and render them latent. But at that stage of the investigation, they were labouring under a very erroneous impression. They believed that air was the necessary vehicle of evaporation and an indispensable intermediary in the process.

They had set out with a working hypothesis based upon the ollowing ideas:

1. An initial heating of the air current by contact with the hot surfaces of the conduit, and consequent initial cooling of the gas.

2. A subsequent cooling or refrigeration of the same air in the same hot conduit by evaporation of water, to be followed by a further and more efficient cooling of the gas.

The experiments had proved the hypothesis to be sound, for the anticipated results had been achieved; but experiments might have been based upon another and a simpler theory—viz., upon evaporation alone within the condenser with the exclusion of air from the evaporating chamber.

The observers had not seen this, and they can only hope that charitably-disposed readers may agree that they were under the influence of a temporary hallucination, probably traceable to what had gone before—viz., the preliminary experiments upon air-cooling by evaporation effected outside the condenser with a view to the subsequent employment of such cooled air therein. It had not so far been realized that evaporation within the condenser would be automatic.

Dominated by this mistaken view, it seemed to the observers that they were again confronted by failure; for if the air were the necessary vehicle of evaporization yet could not be brought up to the point of saturation, it was clear that quite unmanageable volumes of air would be required.

A calculation based upon these unsound premises showed that, to cool in such a condenser 2 million cubic feet of gas, partly by evaporation of a given weight of water through the intermediate agency of an air current still only partially saturated at the air outlet of the condenser, a volume of (say) 10 million cubic feet of air would be required. Attempts were, therefore, made to saturate the air more completely; but it was found that this could only be achieved by a great reduction in the speed of the current, and, necessarily, of the volume of air passed per hour.

To their great surprise, however (such is the tyranny of a preconceived opinion or a fixed idea), the observers found that the efficiency of the apparatus was nearly as great with the slow current as with the larger volume. The speed and volume were, therefore, further reduced; and ultimately the air inlet to the conduit or evaporating chamber was closed—the fan being driven at full speed—when the efficiency of the apparatus, though further reduced, was found to be not very greatly lessened.

Facts speak louder than theories; and at length it stood revealed that the factor of prime importance in the new process was the vaporization of water by the heat energy of the gas which was expended and disappeared in the performance of work, and that the air current was of quite secondary value—its function being in the main mechanical, and consisting in the evacuation or scavenging of the evaporating chamber by blowing out the aqueous vapour.

The realization of these facts pointed to two possible modifications of the apparatus—

1. The possibility of dispensing with the fan and air current and depending upon suitable ports in the evaporating chamber for effecting the removal of the aqueous vapour (and heated air) by natural draught.

2. The removal of the aqueous vapour by an air-pump under barometric vacuum.

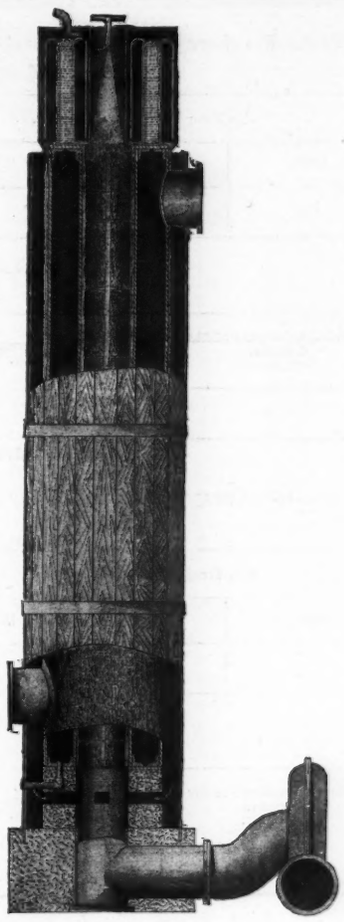
It is obvious that modification No. 1 will be less efficient, owing to sluggish draught due to the rapidly-diminishing pressure of the aqueous vapour in the evaporating chamber towards the cooler end of the condenser. Assuming the temperature of the inlet gas to be 140° Fahr. and of the outlet gas to be 40° or 32° Fahr., the pressures of the aqueous vapour above the atmosphere will vary between 5·86 inches of mercury and 0·248 inch or 5·86 inches and 0·181 inch.

As regards modification No. 2, the experiment was tried by connecting the outlet of the evaporating chamber of the experimental condenser to the air pump of a 30-horse power (nominal) Farey engine, which was driving pumps and washers and condensing normally some 900 lbs. of steam per hour. A vacuum of 25 inches of mercury was indicated throughout the evaporating chamber, into which water was continuously atomized by means of compressed air and a suitable nozzle. Notwithstanding the fact that the water supplied to the "jet" condenser of the Farey engine was at a higher temperature than that of the atomized and vaporized water, a reduction of temperature in the evaporating chamber to a point slightly below that of the atmosphere was effected upon more than one occasion.

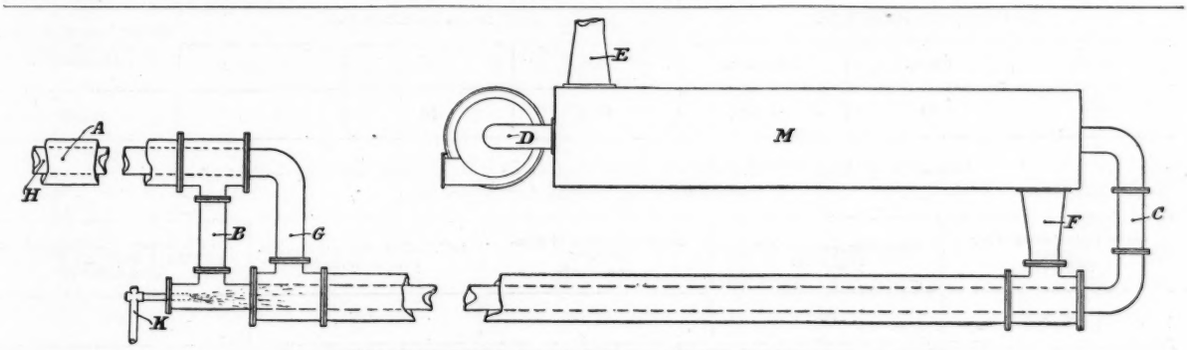
The writer is, however, of opinion that as the temperature of the aqueous vapour in the evaporating chamber will not exceed 140° Fahr. at the hot extremity, and will fall to the temperature of the day at the cold end, it is very doubtful whether the "jet" would condense such vapour fast enough; and it is evident that, apart from efficient condensation, an air-pump would be quite unsuitable for evacuating a large and lengthy chamber, or tube, of its contained vapour. To secure the maximum efficiency of the process, the rapid expulsion of the vapour is of the first importance. By this means alone can continuous evaporation be maintained; and for achieving this object an air-current induced by a fan appears to be the most reliable agent.

The volume of air may be comparatively small, but, whatever its quantity, it possesses—in addition to its mechanical advantage—a value as a secondary cooling agent. Its efficiency as such depends upon its temperature, and its degree of aqueous saturation when introduced to the apparatus.

Upon these lines, condensers of a new type, to be known as "Vaporizing Condensers" have been designed by the writer and Mr. Dean Chandler. The experimental plant has been found very efficient at high, medium, and atmospheric temperatures; and owing to the fact that evaporation of 1 lb. of water absorbs some 1000 B.T.U., the volume of water consumed by the apparatus is trifling.



THE REFRIGERATOR.



THE EXPERIMENTAL PLANT AS FIRST ERECTED.

A.B.C.D. Air Current. E.F.G.H. Gas Current. K. Atomizer. M. Absorbent Devices.

TABLE A.—*Average of Fourteen Tests upon Experimental Condenser (Horizontal Type), without Evaporation of Water, but with Employment of Fan Draught.*

Gas Temperatures in Deg. Fahr.			Air Temperatures in Deg. Fahr.			Hourly Make of Gas at 60° Fahr. and 30 in. Bar. (Actual).
Inlet.	Outlet.	Difference.	Inlet at C.*	Outlet.	Difference.	
139	134·5	− 4·5	88·3	97·9	+ 9·6	47,837

Summary of Above Results, showing Work done in British Thermal Units by Condenser.

[Superficial area of condenser, 240 square feet.]

Mean Temperature of Air Current. Deg. Fahr.	Mean Temperature of Gas. Deg. Fahr.	Mean Difference of Temperatures. Deg. Fahr.	B.T.U. Removed per Square Foot of Surface.	B.T.U. Removed per Square Foot per Degree Difference of Mean Temperatures.
93·1	136·7	43·6	330·6	7·58

* Air admitted at A, and heated in conduit between A and C.

TABLE B.—*Average of Results of Fourteen Tests upon Experimental Condenser (Horizontal Type), with Evaporation of Water and Employment of Fan Draught.*

Gas Temperatures in Deg. Fahr.			Air Temperatures in Deg. Fahr.			Hourly Make of Gas at 60° Fahr. and 30 in. Bar. (Actual).
Inlet.	Outlet.	Difference.	Inlet at C.*	Outlet.	Difference.	
139	126	−13	80	65·8	−14·2	48,430

Summary of Above Results, showing Work done in British Thermal Units by Condenser.

[Superficial area of condenser, 240 square feet.]

Mean Temperature of Air Current. Deg. Fahr.	Mean Temperature of Gas. Deg. Fahr.	Mean Difference of Temperatures. Deg. Fahr.	B.T.U. Removed per Square Foot of Surface.	B.T.U. Removed per Square Foot per Degree Difference of Mean Temperatures.
72·9	132·5	59·6	859·7	14·42

* Air admitted at A, and heated in conduit between A and C. M contains absorbent devices.

TABLE B1.—*Average of Results of Eight Tests upon Experimental Condenser (Horizontal Type), with Atomized Water and Employment of Fan Draught.**

Gas Temperatures in Deg. Fahr.			Air Temperatures in Deg. Fahr.			Hourly Make of Gas at 60° Fahr. and 30 in. Bar. (Actual).
Inlet.	Outlet.	Difference.	Inlet at A.	Outlet at C.	Difference.	
139	125	− 14	70	81	+ 11	47,500

Summary of Above Results, showing Work done in British Thermal Units by Condenser.

[Superficial area of condenser, 420 square feet.]

Mean Temperature of Air Current. Deg. Fahr.	Mean Temperature of Gas. Deg. Fahr.	Mean Difference of Temperatures. Deg. Fahr.	B.T.U. Removed per Square Foot of Surface.	B.T.U. Removed per Square Foot per Degree Difference of Mean Temperatures.
75·5	132	56·5	513	9·0

* Atomizer at K.

TABLE C.—PARTIALLY COOLED GAS.

Average of Results of Eleven Tests upon Experimental Condenser (Vertical Type), with Evaporation of Water and Employment of Fan Draught.

Gas Temperatures in Deg. Fahr.			Air Temperatures in Deg. Fahr.			Gas per Hour at 60° Fahr. and 30 in. Bar. (Approximate).
Inlet.	Outlet.	Difference.	Inlet.	Outlet.	Difference.	
70	60	— 10	48·5	50	+ 1·5	19,985

Summary of Above Results, showing Work done in British Thermal Units by Condenser.

[Superficial area of condenser, 114 square feet.]

Mean Temperature of Air Current. Deg. Fahr.	Mean Temperature of Gas. Deg. Fahr.	Mean Difference of Temperatures. Deg. Fahr.	B.T.U. Removed per Square Foot of Surface.	B.T.U. Removed per Square Foot per Degree Difference of Mean Temperatures.
49·2	65	15·8	102·6	6·5

GAS PURIFICATION BY AMMONIACAL LIQUOR.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.

The use of ammonia for absorbing the acid constituents of coal gas has not received the extended application which it deserves; and it is for the purpose of discussing the possibilities and the hitherto attained that this communication is written. To deal at all adequately with such a wide subject will require that it should be treated both theoretically and practically; but the theoretical consideration, which will first be undertaken, will be confined to an understanding of the principles upon which successful practical working rests.

The constituents of coal gas and carburetted water gas fall broadly into two classes—(*a*) the useful, which are almost wholly insoluble in water, and (*b*) the useless, injurious, or impurities which are nearly all soluble in water. The latter class falls also into two important subdivisions—(*c*) the bases, represented by ammonia, and (*d*) the acids. It is because of these fortunate lines of demarcation that in almost all gas-works some part of the purification is done by washing the gas with water or ammoniacal liquor; but not in all cases is the principle utilized as fully as the circumstances will permit. It is the high degree of solubility which ammonia possesses that is the basis of the processes of liquor purification as commonly practised and as proposed to be amplified by Hills, Claus, and others, for that property, while enabling the gaseous ammonia to be washed out, at the same time provides a useful and almost ideal absorbent for the accompanying impurities.

SOLUTION.

Exact inquiries into the nature of solution made by Thomsen, Ostwald, van't Hoff, and other workers in physical chemistry, show that water is not always a neutral body towards substances dissolved in it. According to the nature of that substance, so the absorption may only be physical or it may be chemical—the water reacting as feebly acid or feebly basic. The effect of the absorption of a gas by water may be measured by the thermal effects observed by a rise or fall of temperature, and may be due either to the changed physical condition under which the gas exists or to the chemical action which has taken place. The exact effect of gaseous absorption may be measured by specific gravity and in many other ways, as studies in specific volume, osmotic pressure, &c., have shown; but these latter minutiæ may be almost left out of consideration in this strictly utilitarian survey.

At 0°C., and under ordinary atmospheric pressure, 1 volume

TABLE D.—GAS FROM GASHOLDER.

Results of Tests upon Refrigerating Experimental Condenser (Winter).

Gas Temperatures in Deg. Fahr.		Air Temperature Deg. Fahr. (Natural.)	Water Temperature Deg. Fahr. (Natural.)	Temperature of Evaporating Chamber Deg. Fahr.	Natural Humidity of Air. Per Cent.	Gas per Hour at 60° Fahr. and 30 in. Bar. (Actual).
Inlet.	Outlet.					
48·0	46·0	50·0	50	46	68	13,420
48·0	46·0	50·0	50	46	68	14,590
48·0	46·0	50·0	50	46	68	13,130
48·0	46·0	50·0	50	46	68	9,520
45·0	41·0	41·0	46	39	65	14,472
45·5	41·0	40·5	46	39	65	14,970
45·5	41·0	39·5	46	39	65	14,210
45·5	41·0	39·5	45	39	65	15,290
43·5	39·0	41·0	44	39	56	14,640
44·0	40·0	41·0	44	39	56	14,760
44·5	41·0	42·5	44	39	56	14,600
44·5	41·5	42·5	44	39	56	14,520
43·0	39·5	39·0	42	38	68	14,960
43·0	39·5	39·5	42	38	68	14,960
43·0	39·5	39·5	42	38	68	14,760
43·0	39·5	39·5	42	38	68	13,370
43·0	39·0	39·0	39	38	65	14,500
43·0	39·0	39·0	39	38	65	14,500
43·0	39·0	39·0	39	38	65	14,500
43·0	39·5	39·0	39	38	65	14,700
44·7	41·2	42·0	44·1	40	64·4	14,218 aver.

Summary of Above Results, showing Work done in British Thermal Units by Condenser.

[Superficial area of condenser, 300 square feet.]

Temperature of Evaporating Chamber. Deg. Fahr.	Mean Temperature of Gas. Deg. Fahr.	Mean Difference of Temperatures. Deg. Fahr.	B.T.U. Removed per Square Foot of Surface.	B.T.U. Removed per Square Foot per Degree Difference of Mean Temperatures.
40	42·9	2·9	4·15	1·43

TABLE E.—GAS FROM GASHOLDER.

Results of Tests upon Refrigerating Experimental Condenser (Summer).

Gas Temperatures in Deg. Fahr.		Air Temperature Deg. Fahr. (Natural.)	Water Temperature Deg. Fahr. (Natural.)	Temperature of Evaporating Chamber. Deg. Fahr.	Natural Humidity of Air. Per Cent.	Gas per Hour at 60° Fahr. and 30 in. Bar. (Actual).
Inlet.	Outlet.					
70	65	75	70	64	46	30,800
70	65	75	70	64	46	29,600
70	65	75	70	64	46	29,100
70	65	75	70	64	46	29,200
72	67	75	67	65	50	28,800
72	67	75	67	65	50	28,600
72	67	75	67	65	50	28,200
72	67	75	67	65	50	28,400
72	66	74	67	65	41	29,200
72	66	74	67	65	41	30,000
72	66	74	67	65	41	30,000
72	66	74	67	65	41	30,200
68	64	68	68	63	50	29,800
68	64	68	68	63	50	29,600
68	64	68	68	63	50	30,800
68	64	68	68	63	50	30,600
67	63	70	68	63	55	30,200
67	63	70	68	63	55	30,000
67	63	70	68	63	55	30,400
67	63	70	68	63	55	29,800
69·8	65	72·4	68	64	48·4	29,660

Summary of Above Results, showing Work done in British Thermal Units by Condenser.

[Superficial area of condenser, 300 square feet.]

Temperature of Evaporating Chamber. Deg. Fahr.	Mean Temperature of Gas. Deg. Fahr.	Mean Difference of Temperatures. Deg. Fahr.	B.T.U. Removed per Square Foot of Surface.	B.T.U. Removed per Square Foot per Degree Difference of Mean Temperatures.
64	67·4	3·4	28·91	8·5

of water will, when saturated, absorb, according to Sims, 1177 volumes of ammonia gas. The numbers obtained by Bunsen and Carius were each about 10 per cent. lower than this; and the one obtained by Berthelot was 10 per cent. higher, while that of Roscoe and Dittmar was very nearly the same as that of Sims. This very high solubility diminishes with rise of temperature; so that at 100°C., it is less than 1-12th that at 0°C., as the following table shows. These figures, of course, refer to saturated solutions at 760 mm. pressure for the temperature stated.

TABLE I.—*Weight of Ammonia, in Grammes, absorbed by One Gramme of Water (Sims).*

Temp.	Grammes.	Temp.	Grammes.	Temp.	Grammes.
0°C.	0·899	40°C.	0·338	80°C.	0·154
10°	0·684	50°	0·284	90°	0·114
20°	0·518	60°	0·238	98°	0·082
30°	0·408	70°	0·194	100°	0·074

The specific gravity of a solution of ammonia in water is lower than unity, and at 15°C. (59°Fahr.), taking water at 4°C. = 10,000, their specific gravity as dependent on p, or the percentage amount by weight of ammonia, is given by the expression $s = 9992 - 42{\cdot}5\,p + 0{\cdot}21\,p^2$.

TABLE II.

Per Cent. by Weight of NH_3 at 15°C.	Specific Gravity, Water at 4°C. = 10,000.	Lowering Effect on Specific Gravity, as shown on Twaddell's Hydrometer in Degrees.
1	9950	1·00
2	9908	1·84
3	9867	2·66
4	9826	3·48
5	9785	4·30
6	9745	5·10
7	9705	5·90
8	9666	6·68
9	9627	7·46
10	9588	8·24

Note.—If the temperature be equal $t°$, but not less than 10°C., or above 20°C., then the expression $(15 - t)\,(1{\cdot}5 + 0{\cdot}14\,p)$ must be added to the formula for the specific gravity.

Another gas besides ammonia—viz., hydrocyanic acid (HCN.)—has a similar effect on the specific gravity of its solution. Like ammonia, it does not largely exist in ammoniacal liquor uncombined; but to the extent that it is so present, its effect upon the specific gravity masks the increase due to the various ammonium compounds. The exact composition of the gas in crude coal gas which provides the cyanogen radical (CN) is not definitely known; but the balance of opinion is in favour of hydrocyanic acid gas, since it is more stable than either cyanogen or ammonium cyanide. Indirectly, this view is confirmed by the fact that prussian blue has been recovered from the waste gases from a saturator in a sulphate of ammonia works, and that the Chief Inspector of Alkali Works (Mr. R. Forbes Carpenter) has recently shown hydrocyanic acid to be present in gases having a similar origin. Hydrocyanic acid gas is very soluble in water—2 per cent. of the gas producing a specific gravity of ·9974, 4 per cent. of ·9940, and 8 per cent. of ·9840; but its volume solubility at varied temperatures does not appear to have been determined. Cyanogen (CN) is dissolved by water at 20° C. to the extent of 4 to 5 volumes, and it is absorbed, with decomposition, by ammonium hydrate in solution.

The other gaseous impurities—carbon dioxide and sulphuretted hydrogen—which are of chief importance in purification have much smaller solubility in water than has ammonia. In Table III. the values at various temperatures are given in terms of the volume of gas absorbed by 1 volume of water at 760 mm. pressure and the stated temperature. Some of the figures (those marked with an asterisk), are the result of calculation from observations taken at other slightly different temperatures, or by different experimenters.

TABLE III.

Temperature.		CO_2.	H_2S.	NH_3.	In Comparison with CO_2 as Unity.	
Deg. C.	Deg. F.				H_2S.	NH_3.
0	32	1·7967	4·371	1049·60	2·43	583·3
5	41	1·4497	3·965	917·90	2·70	633·0
10	50	1·1847	3·586	812·76	3·03	689·0
15	59	1·0020	3·233	727·22	3·20	720·0
20	68	0·9014	2·905	654	3·22	726·0
25	77	0·80*	2·60	586	3·25	732·5
30	86	0·63*	2·33	529*	3·70	839·7
35	95	0·55*	2·08	462*	3·78	840·0
40	104	0·50*	1·86	403*	3·72	806·0
Solubility compared with that at 0°C.						
25	77	0·44	0·60	0·55	..	..
40	104	0·28	0·42	0·38		

The last two lines of the foregoing table show that the proportion of absorption suffers by rise of temperature more in the case of carbon dioxide than of ammonia, and the latter than of sulphuretted hydrogen; while the last two columns show the same facts in the form of relative absorption when that of carbon dioxide at each temperature is taken as unity.

The relative intensity with which the gases already mentioned take hold of water is made apparent by the "heats of solution" that were ascertained by Thomsen, recorded in his "Thermo-Chemistry." From these figures [Table IV.], we learn that not only is ammonia taken up in greatest volume, but that, in proportion to formula weight, the union is productive of most heat; while carbon dioxide, having a smaller volume solubility than sulphuretted hydrogen, gives out per formula weight more heat than the latter.

CHEMICAL COMBINATION.

The "heats of neutralization" of ammonia with various acids show the comparative weakness of hydrocyanic acid, sulphuretted hydrogen, and carbon dioxide as against hydrochloric, nitric, and sulphuric acids, and, in conjunction with the "avidities" referred to later, explain at once the formation of "fixed ammonia" in the early stages of the production and condensation of gas. The action of carbon dioxide is notably greater than that of sulphuretted hydrogen or hydrocyanic acid.

TABLE IV.—*Heats of Solution Measured at 18° C.*

Substance gaseous.	Formula and Weight.	Formula Weights of Water in the Solution.	Heat of Solution per Formula Weight of the Gas.	Ratio to Ammonia as Unity.
Sulphuretted hydrogen	H_2S 34	900	4560	0·541
Carbon dioxide . . .	CO_2 44	1500	5880	0·697
Hydrocyanic acid . .	HCN 27	..	6100*	0·723
Ammonia	NH_3 17	200	8430	1·000

* The figure for hydrocyanic acid gas is by Berthelot. The absorption of *liquid* hydrocyanic acid is, at certain concentrations, accompanied by a reduction of temperature.

Parellel to ammonia and its compounds are given in Table V. analogous ones with soda and with lime, to show the greater basic power of the latter substances. Most of the figures are from the thermal researches of Thomsen, and are for compounds remaining in solution, not precipitated. Those marked B are from Berthelot's "Thermo-chimie."

The results of a more extended investigation, including several of the commoner organic acids, is given in Table VI. The calories in this table are kilogramme calories, and the numbers require to be multiplied by 1000 to be comparable with those in previous tables. They are for the formation of the principal salts in the dissolved or precipitated state by means of dissolved acids (one equivalent dissolved in 2 or 4 litres of liquid) at 15° C. according to Berthelot and Thomsen.

The heat of combination of the four bases has not in every case been ascertained for sulphocyanic acid and ferrocyanic acid; but the behaviour of these acids has been found to be almost as strong as hydrochloric acid. Thus for potassium ferrocyanide the heat of combination is 13·5, against 13·7 for potassium chloride, upon the basis of one atom of hydrogen replaced in each instance. Sulphocyanic and ferrocyanic acids are more powerful than sulphuretted hydrogen, carbonic acid, or hydrocyanic acid. The heat of combination with thiosulphuric acid ($H_2S_2O_3$) does not appear to have been determined; but there is reason to believe that it is higher than carbonic acid (H_2CO_3) in the case of ammonia, as the salt of that base is generally found in ammoniacal liquor after boiling.

AVIDITY OR AFFINITY.

Table V. shows the relative strength of three bases and of six acids, in so far as this can be known from the heat of neutralization; but the "avidity" of any acid relative to another, or of any base relative to another, cannot be predicated from the thermic effect alone. This property can only be measured by experiments made under definite conditions where account is duly taken of the masses of the several components present, of the solubility of the salts formed, of the volatility of the acid, of the relative volume of water, and of the temperature—all of which have an influence on the distribution of base and acid. The standard conditions are when equal molecular quantities are present under conditions of solubility and temperature equally favourable; and under such precautionary conditions it has been found that various acids and bases have the relative avidities given in the Table VII. The numbers represent the power of replacing each other in combinations, while the "heat of neutralization," as given in Tables V. and VI., informs us of the transfer of energy as heat per molecular unit of that combination.

TABLE VII.—*Avidities, determined by Thomsen, Ostwald,* &c.

Acids.	—	Bases (Hydroxides).	—
Hydrochloric	100	Lithium	100
Nitric	100	Potassium	98
Sulphuric	49	Sodium	98
Oxalic	24	Thallium	89
Ortho-phosphoric	13	Tetraethylamine	75
Mono-chloracetic	9	Calcium	?
Hydrofluoric	5	Triethylamine	14
Tartaric	5	Ethylamine	12
Formic	3·9	Ammonium	2
Acetic	3		
Hydrocyanic . . . nearly	0		

Thus in a solution containing molecular proportions of sodium and ammonium hydroxides, the acid present would be distributed between these bases in the proportion of $\frac{98}{98+2} = \frac{98}{100}$ for sodium to $\frac{2}{98+2} = \frac{2}{100}$ for ammonium. Similarly, under standard conditions, if oxalic and acetic acids were present, the base would

TABLE V.—*Heats of Neutralization.*

Q Base.	Sulphuric Acid. Q SO_4H_2 Aq.	Hydrochloric Acid. Q 2 HCl Aq.	Nitric Acid. Q 2 HNO_3 Aq.	Carbonic Acid. Q CO_2 Aq.	Sulphydric Acid. Q 2 H_2S Aq.	Hydrocyanic Acid. Q 2 HCN Aq.
2 NH_3 Aq.	28,150	24,540	24,640	10,600 B (*a*) 16,850*	(*b*) 6195	2600
2 NaOH Aq.	31,380	27,490	27,360	20,180	7740	2770
CaO_2H_2 Aq.	31,140	27,900	27,800 B	19,600 B 18,510	7800 B	6400 B

* This figure is when 100 H_2O is present, but when 400 H_2O is present it becomes 15,900.
(*a*) Compound produced, $(NH_4)_2CO_3$. (*b*) Compound produced, $2(NH_4)HS$.

TABLE VI.

Bases.	Oxalates. $\frac{1}{2}C_2H_2O_4$.	Sulphates. H_2SO_4.	Chlorides. HCl.	Nitrates. HNO_3.	Acetates. $C_2H_4O_2$.	Formates. CH_2O_2.	Carbonates. CO_2.	Sulphides. H_2S.	Cyanides. HCN.
Soda (Na_2O)	14·3	15·85	13·70	13·7	13·3	13·4	10·2	3·85	2·9
Potash (K_2O)	14·3	15·70	13·70	13·8	13 3	13·4	10·1	3·85	3·0
Ammonia (NH_3)	41·7	14 50	12·45	12·5	12·0	11·9	5·3	3·10	1·3
Lime (CaO)	18 5	15·60	14·00	13·9	13·4	13·5	9·8	3·90	3·2

Note.—A few of the figues in Tables V. and VI. are not concordant; but they agree to the extent of showing the relative thermal effects.

be distributed therewith in the ratio of $\frac{24}{24+3}=\frac{24}{27}$ for oxalic and $\frac{3}{24+3}=\frac{3}{27}$ for acetic acid.

This discrimination between "avidity" and heat-producing helps to clear away some of the ambiguity usually associated with the terms "strong" and "weak." Taken in conjunction with Table VI., it will help to an understanding of the subject so far as the compounds of the alkalis ammonia and lime are concerned. It will be seen that (as in the case of oxalate of ammonia) low avidity is sometimes followed by high heat of neutralization; but generally it is the bases and acids of high avidity that have a high average heat of neutrallzation. From these general principles, and in the absence of complete data as to the avidities of hydrocyanic, sulphocyanic, ferrocyanic, hydrosulphuric, and carbonic acids, we may infer upon what lines we may expect combination to take place between ammonia and the acids of crude illuminating gas.

(To be continued.)

STATISTICS OF AMERICAN PUMPING-STATIONS.

It may be remembered that, in the course of the proceedings at the annual meeting of the British Association of Water-Works Engineers, the subject of the cost of pumping was brought forward in a paper by Messrs. Meysey-Thompson and Lupton. In the discussion on the paper, a suggestion was thrown out that if information could be obtained from various stations it would be found useful. Acting upon it, the "Engineering Record" recently published the following statistics in regard to the operation of pumping-stations in America, taken from a report made by Mr. W. J. Sando to the Commission (consisting of Messrs. Burr, Hering, and Freeman) entrusted with inquiring into the question of providing an additional supply of water for New York. Our contemporary points out that, in making comparisons between English and American records, it has to be borne in mind that the wages paid to attendants are about 50 per cent. higher on the other side of the Atlantic than they are here. Great caution is also advisable in making comparisons between pumping-stations; and therefore the figures are given rather as interesting records on the lines suggested on the occasion alluded to. The statistics relate to the pumping of the water supplies of twelve large cities for the year 1902 in all but three cases—Manhattan, based partly on the four months from May to August, 1903; Brooklyn, data obtained from the last published report (1896); and Pittsburgh, data from the report for 1899. In several of the cities, antiquated stations, with old and uneconomical machinery, are being replaced by modern plant.

The data collected led to a comparison of the total unit costs of pumping in various cities, exclusive of interest and sinking fund. Calling the cost of pumping a million gallons of water 1 foot high with coal at $1 per ton of 2240 lbs., for the city of lowest cost, 100, the relative figures for 1902, based on the entire pumping, are as follows: Boston, 100; Providence, 115; Baltimore, 131; Milwaukee, 163; Manhattan, 173; Philadelphia, 205; Cleveland, 238; Buffalo, 287; St. Louis, 303; Pittsburgh, 345; Brooklyn, 355; and Cincinnati, 668.

In recapitulating, Mr. Sando states the elements conducive to pumping water cheaply as follows: Efficient engines and boilers, the latter carefully fired, operated continuously under contract conditions or overload not beyond that for which the machinery is designed; simplicity and directness in steam and water piping within stations; the prevention of radiation from boilers, steam-pipes, and cylinders; the heating of feed water by waste heat; the supply of dry or superheated steam, and the minimum amount of auxiliary machinery operated otherwise than by the main engine. Independent auxiliary machinery (air-compressor and feed-pumps) is necessary, and should always be installed to be used in case of emergency. The station duty is liable to be reduced from 5 to 10 per cent., according to the size of the plant, when the independent air-compressor and feed-pumps are used in regular running.

There are sundry safeguards and attention to details of firing and engine driving which add scarcely anything to the expense, and are insisted on during a duty trial, that are often abandoned as soon as the test is over. It is customary for contractors to adjust the machinery and see that everything is in the best condition for the highest efficiency before the official duty test or final payment on contract is made. Gauges, thermometers, and indicators are used to adjust pressures in the steam cylinders and jackets, to record temperatures of steam, flue gases, and feed water, and to show the steam distribution in the cylinders. The use of these instruments is absolutely essential to good economy; and in order to keep the machinery in good condition, they should be made permanent adjuncts to every plant, instead of being taken away when the trial is over. Records should be kept hourly of the revolutions made by the engines, the quantity of water pumped, the total lift on the pumps, the fuel consumed, the supplies used, all pressures and temperatures, and notes made daily of anything out of the ordinary way about the machinery and station. Indicator cards should be taken and computed as often as it is found necessary, in order to keep the engines in good order. Supplies in sufficient quantities and duplicates of small parts, known from experience to require renewal frequently, should be kept on hand. Lubricants should not be curtailed. Efficient means should be provided for preventing waste.

Name of City.	Average Quantity Pumped in 24 Hours.	Average Head Pumped Against.	Average Cost of Coal in Bins, Ton of 2240 lbs.	Division of Total Pumping Expenses.		Cost of a 24-Hour Pump Horse Power.		Cost of Coal for a 24-Hour Pump Horse Power, at $1 per Ton of 2240 lbs.
				Labour.	Fuel, Repairs, and Supplies.	Based on Cost of Fuel only.	Based on Total Pumping Expenses.	
	Gallons.	Feet.	Dollars.	Per Cent.	Per Cent.	Dollars.	Dollars.	Dollars.
Philadelphia	320,000,000	205·00	3·38	34	66	53·27	100·36	15·77
Baltimore	24,260,000	177·30	3·46	..	..	46·75	64·97	13·51
Boston	115,070,000	71·23	5·07	44	56	32·26	73·34	6·36
Pittsburgh	60,400,000	256·00	0·986	44	56	17·29	49·06	17·53
Cincinnati	55,580,000	248·60	1·39	43	57	36·10	139·74	25·97
Buffalo	114,000,000	147·73	1·86	39	61	25·64	76·76	13·82
St. Louis	135,800,000	154·20	1·50	40	60	25·99	65·71	17·32
Milwaukee	29,760,000	145·47	3·30	59	41	25·17	77·73	7·62
Cleveland	73,720,000	205 10	1·48	48	52	19·19	51·40	12·59
Providence	13,260,000	171·60	5·18	35	65	36·84	86·51	7·11
Brooklyn (borough)	173,400,000	107·40	3·15	42	58	52·44	161·60	16·65
Manhattan (borough)	52,770,000	111·55	5·25	48	52	66·63	128·46	12·69
Chicago	358,100,000	102·40	2·85	35	65	40·17	101·43	14·24

CONDENSING AND COOLING GASES, VAPOURS, AND LIQUIDS.

Brown and Chandler's Patent.

Elsewhere in the "JOURNAL" to-day an interesting article appears, from the pen of Mr. A. F. Browne, giving particulars of a new departure in apparatus for condensing and cooling gases, vapours, and liquids—the outcome of a patent taken out by himself and Mr. Dean Chandler, who is also connected with the South Metropolitan Gas-Works, Vauxhall.

From a copy of the specification of this patent—No. 5485, dated March 5, 1904—it appears that the principal claim made by the inventors is for a "method or means for condensing and cooling gases, vapours, and liquids, wherein a current of air circulated naturally or by suitable means is passed into and out of a chamber in which water is evaporated by the heat of the liquids, gases, or vapours being cooled; the water being carried or circulated through the chamber by absorbent devices which spread within the chamber or upon the walls of it water supplied to them by gravitation or otherwise, or the water may be carried or circulated in the chamber in suitable receptacles and distributed by the agency of absorbent devices which offer by capillary attraction wetted surfaces to the influence of heat and of the air current, or the water may be supplied to the chamber in the form of a mist or cloud."

The invention, it is thus seen, is based upon the principle of evaporating water by means of the heat present in, and to be removed from, the bodies which are to be cooled and condensed; and the passage of such water from the liquid to the vaporous state is accompanied by absorption and disappearance of heat which becomes latent in the vapour or steam produced.

To effect and facilitate evaporation in accordance with this invention (the specification proceeds) water is distributed within an evaporating chamber upon suitable surfaces adapted to carry, distribute, or spread the water by absorption, or by capillary attraction; the water being fed to the surfaces from above, beneath, or other suitable position, or water may be carried or circulated in any suitable receptacle or receptacles upon, or adjacent to, the surfaces from which the heat is passing or to be extracted —the receptacles carrying or feeding the distributing means. The water may also be supplied to the evaporating chamber, and to the surfaces of it or therein contained in the physical condition of a spray, mist, or cloud produced by the agency of an atomizer or other suitable means, or as a cooled cloud of condensed steam. Evaporation may also, if desired, be effected under a vacuum or partial vacuum by subjecting the evaporating chamber to suction or exhaust.

The maximum efficiency of the apparatus is said to be attainable when the vapour or steam produced is rapidly removed from the evaporating chamber, under which circumstances continuous evaporation is effected. With this object in view, an air current may, by the agency of a fan, exhauster, or blower, or other suitable means, be employed to circulate, convey, and expel the aqueous vapour produced within and from the evaporating chamber. Such an air current constitutes a secondary cooling agent; its efficiency as such, varying with its temperature and its degree of aqueous saturation or humidity.

In a modification of the apparatus, the removal of the aqueous vapour may (though with reduced economy and efficiency) be effected by allowing it to escape through ports or apertures in the evaporating chamber communicating with the atmosphere.

The apparatus employed may, it is pointed out, comprise a

Fig. 3.

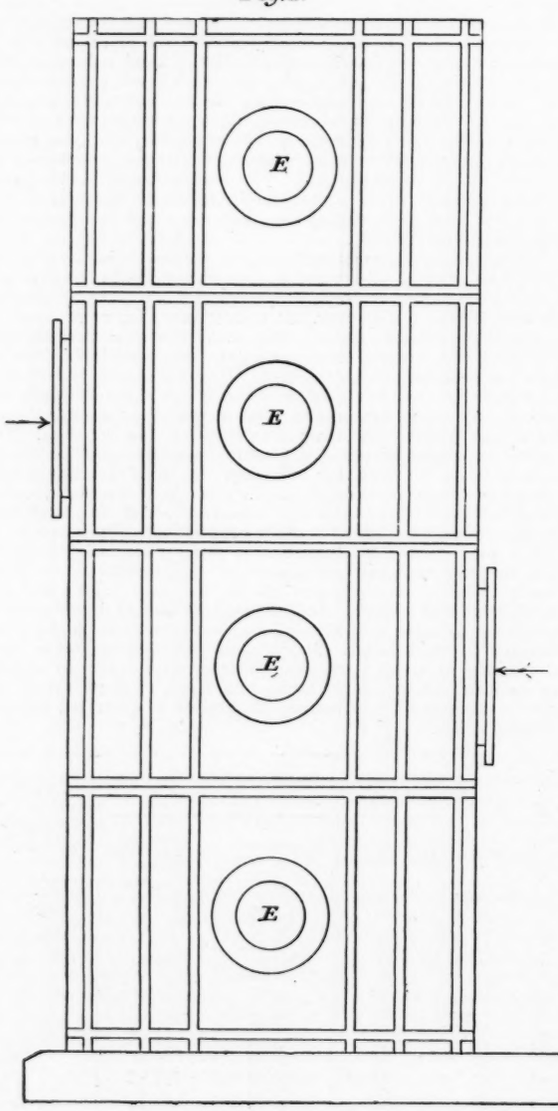
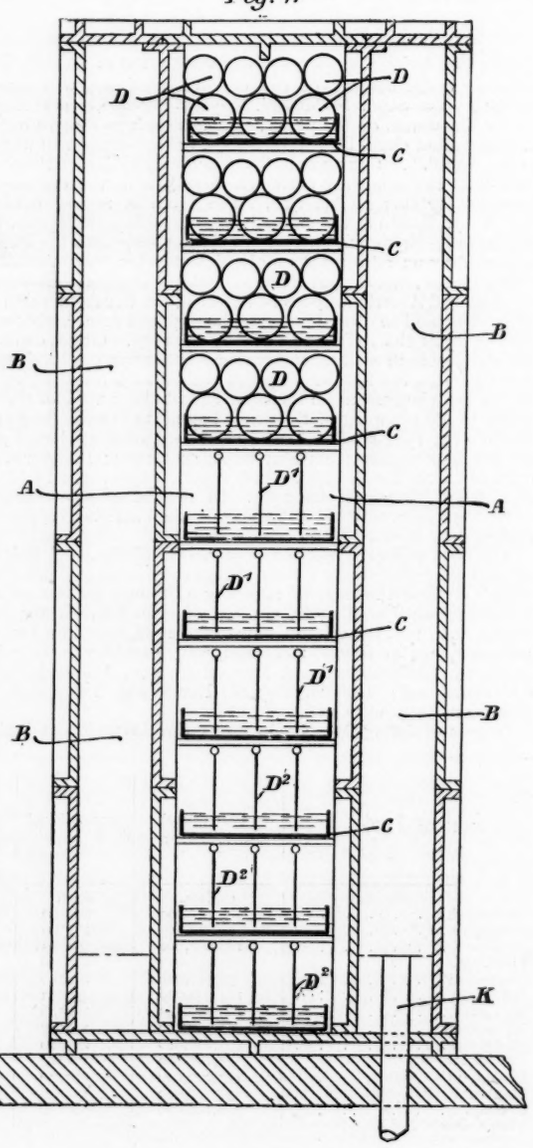


Fig. 1.



chamber or chambers suitably divided by partitions separating the gases, vapours, and liquids to be cooled and condensed from the evaporating chamber or chambers; or the apparatus may consist of cylindrical tubes (vertical, inclined, or horizontal) within other tubes—single or in groups—and extended into series, "providing in every type sufficient surface area to secure efficiency of the apparatus adequate to the work required."

Three forms of apparatus in accordance with the invention are shown in the drawings accompanying the specification. Fig. 1 is a transverse section, fig. 2 is a side elevation partly in section, and fig. 3 is an end elevation of one form. Figs. 4 and 5 show a part sectional side elevation and an end view of a modified construction. Figs. 6 and 7 are a sectional elevation and sectional plan of a further modification.

In figs. 1, 2, and 3, A is an evaporating chamber, of rectangular form, sandwiched between two chambers B B, containing the gases, vapours, or liquids to be cooled, or through which they are passed. By this arrangement a large quantity of the heat to be removed is radiated and conducted to the atmosphere direct by the exposed surfaces, with a corresponding reduction of duty of the evaporating chamber and a diminished area of apparatus. If preferred, the parts of the apparatus containing the hot bodies may be sandwiched between, or entirely jacketed by, the parts within which the water is evaporated.

The evaporating chamber is fitted throughout with a series of shallow trays C spaced apart; and water is continuously supplied to the trays—being fed to the upper trays and thence overflowing from tray to tray. D, D^1, and D^2 are absorbent devices. Three different forms are shown, and one or all of the forms may be used in a single apparatus. D are cylindrical wire scrolls; D^1 are flat wire screens, all laced with strands of cotton or other suitable material; and D^2 are curtains of cotton fabric, or other material, suitably suspended.

These devices, disposed throughout the evaporating chamber, are partially immersed in the water carried by the trays so as to offer, by capillary attraction, a large wetted surface to the influence of the heat and the air current. These, or other absorbent devices and material, may if desired be placed in actual contact with the surfaces of the parts enclosing the hot gases, vapours, or liquids, and may be supplied with water by any suitable means.

E E are the air inlets of the evaporating chamber.

Figs. 4 and 5 illustrate a vertical cylindrical type of the apparatus. In this type, the evaporating chamber A is entirely jacketed or surrounded by the chamber B containing the bodies to be condensed or cooled; the arrangement being adopted for the economical reasons specified in the description of figs. 1 to 3. If preferred, the hot bodies may occupy the inner tube, and be entirely surrounded by the evaporating chamber.

The drawings show an arrangement of water trays C carrying laced wire scrolls D as previously described in connection with figs. 1 to 3. Fig. 4 also shows an alternative method of distributing the water within the evaporating chamber in the form of a mist by employing an atomizer I or other suitable means.

E is the air inlet to the evaporating chamber or series of chambers; G is the inlet for water; and H is the outlet for any surplus water. K is the sealed outlet for tar and other liquids deposited in the cooling or condensing chambers B.

In operation, the gases, vapours, or liquids pass through the chambers B. The heat therefrom acts upon, and evaporates, the water distributed throughout the evaporating chamber A, as described; and, owing to the large quantity of heat absorbed by the evaporation, the gases or other bodies are effectively cooled. Thus the working of the apparatus is continuous—a constant supply of water and regular removal of the resultant aqueous vapour or steam by the air current. The constant removal of the surplus water is also maintained by suitable circulating means, which may also serve to maintain a reduced pressure in the chambers where evaporation takes place.

It is anticipated (say the patentees) that, under favourable atmospheric and other physical conditions, whether natural or artificial, it will be found possible to cool the hot bodies by the

Fig. 2.

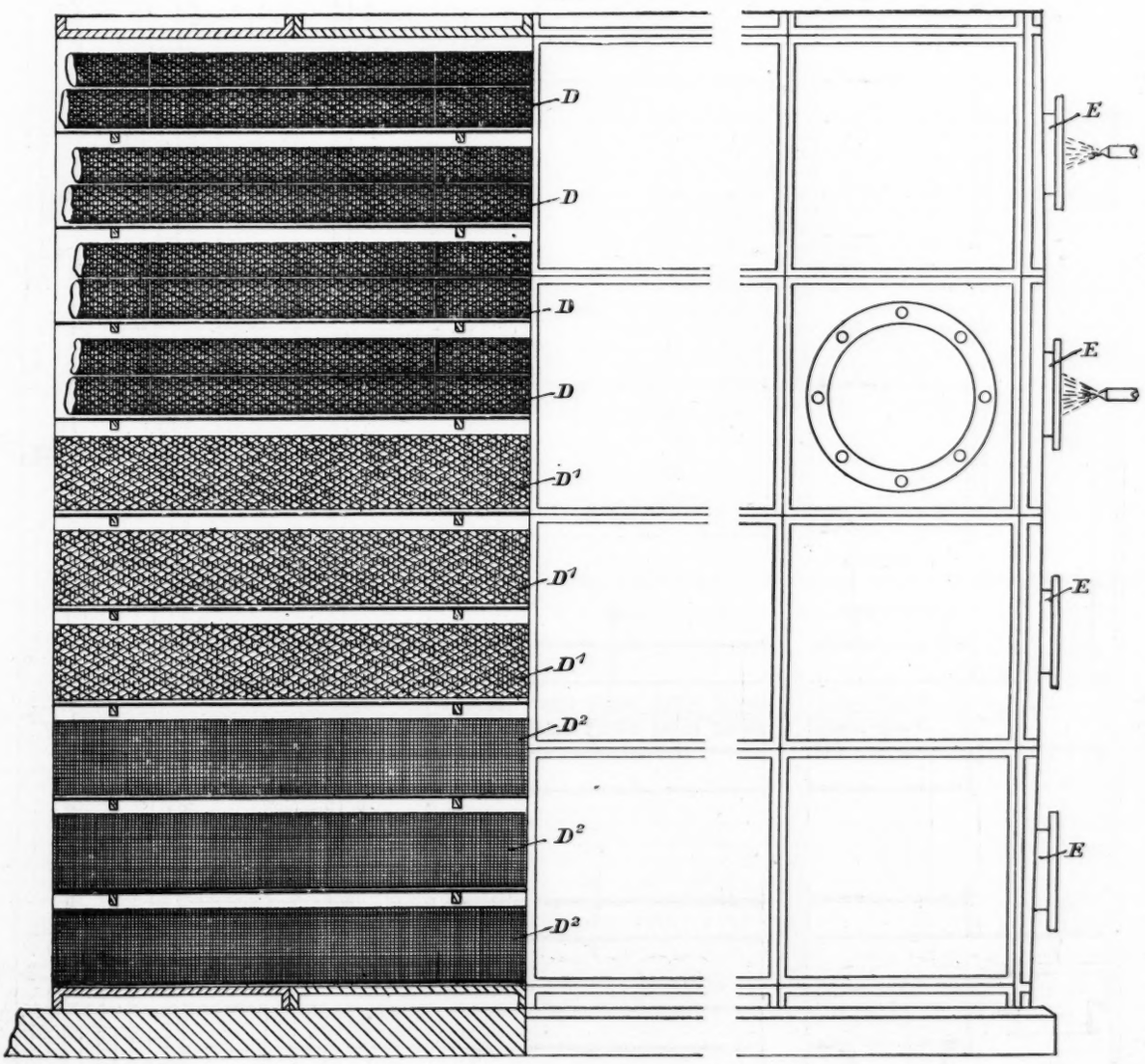


Fig.7.

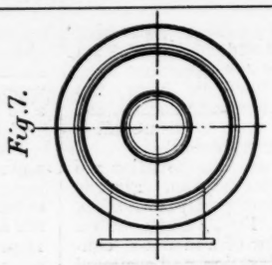


Fig.6.

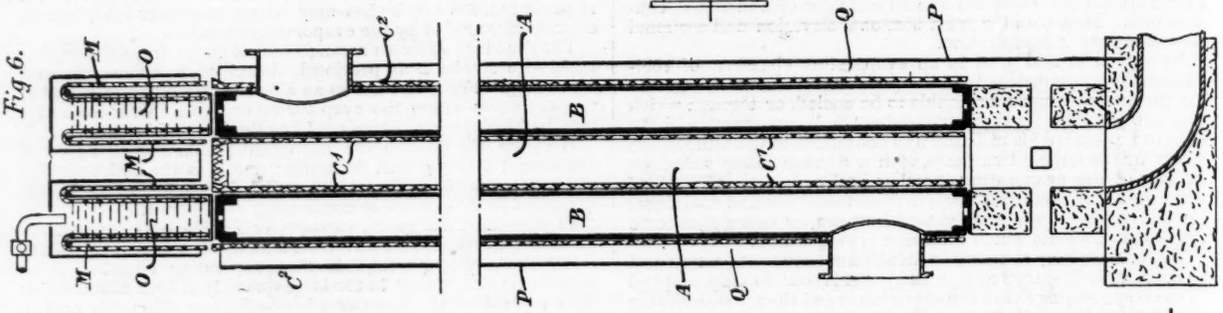


Fig.5.

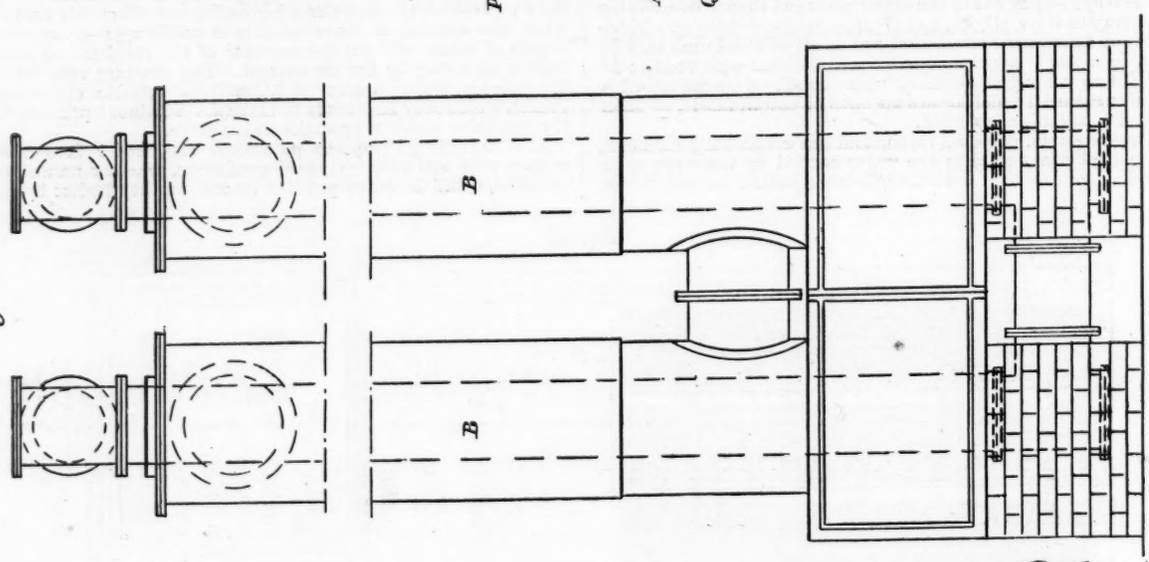
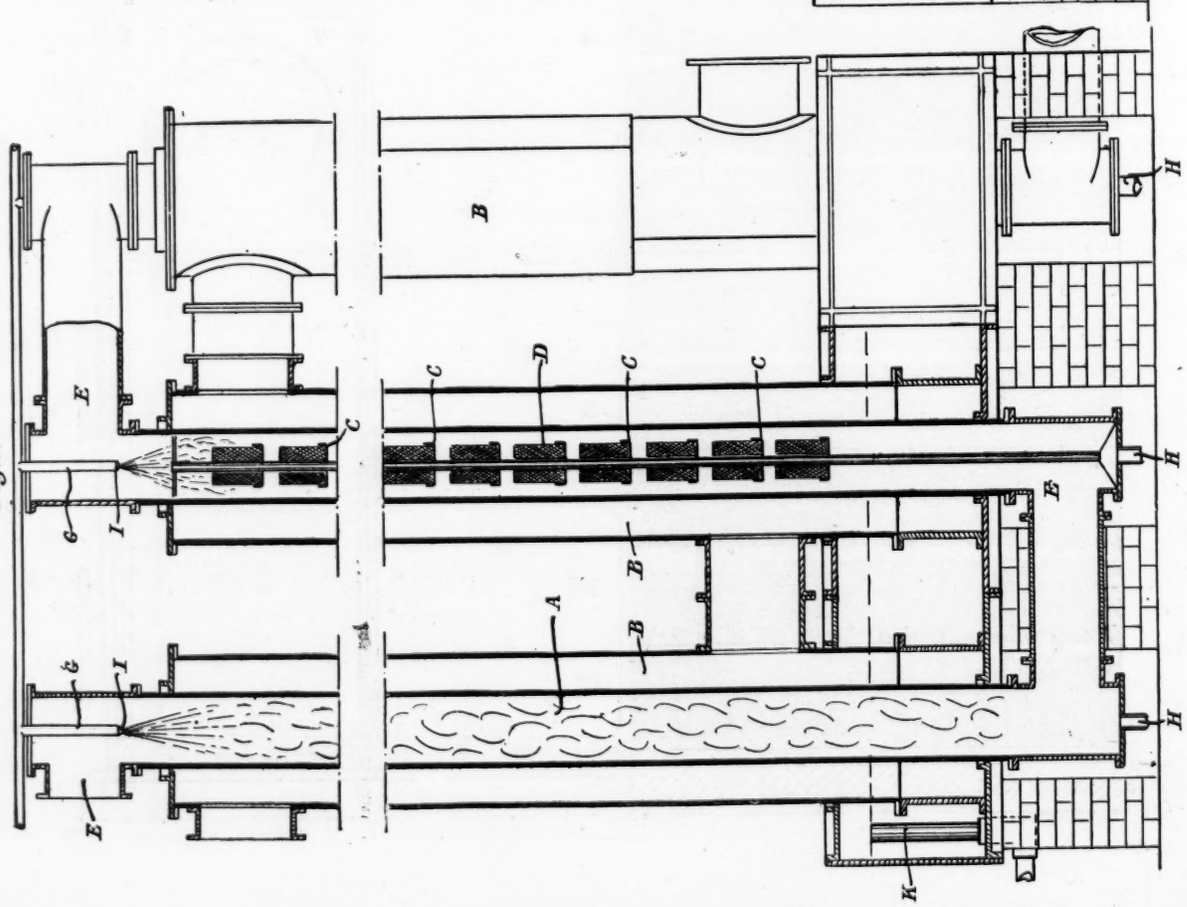


Fig.4.



apparatus described from temperatures above that of the atmosphere to temperatures below that of the atmosphere. The most favourable conditions are dependent upon: 1. The hygrometric state of the air employed, or its degree of aqueous saturation. (The air should be dry or comparatively dry). 2. Upon the relative temperatures of the air and water employed.

Experiments point to the conclusion that the temperature of the air should be equal to, or slightly higher than, that of the water.

In fig. 6 a form of apparatus is shown by means of which it has been found possible, under favourable conditions attaching to the air and water employed, to cool the bodies below the temperature of the atmosphere. In this form, the evaporating chamber A is lined with a thin and loosely packed or laced layer or skin of absorbent material C, carried upon a suitable support (such as wire netting), built upon a hollow cylindrical skeleton of lath and hoop iron. By these means the wet absorbent material is brought into actual contact with the surface of the chamber, and is maintained in a more or less saturated condition by water supplied to it by any suitable means.

The means shown for supplying the water consists of ordinary cotton wicks or "trimmers" M, by which the water is syphoned out of a tank O mounted on the top of the apparatus. The bodies to be cooled are, as before, contained in the chamber B. The outer surface of this chamber is similarly jacketed by a thin and loose layer of absorbent material C^2, and supplied with water by similar means from the tank O. Copious streams of water (such as will minimize the evaporative effect) are not contemplated, but a constant supply in small and controllable quantities in contact with the metallic surfaces. The whole apparatus is enveloped or jacketed by a casing or lagging P; an air space Q being left between the outer casing and the absorbent layer C^2. The air space Q constitutes a second evaporating chamber.

The atomizer or similar devices mentioned may be used in combination with the other absorbent or capillary devices, and thus serve also to supply the necessary water to the latter.

Air is driven or drawn through the evaporating chambers A and Q by means of a fan or exhauster or equivalent apparatus, which may maintain a reduced pressure or vacuum in parts of the apparatus.

The last described apparatus or means need only be applied after the hot bodies have been cooled down to the temperature of the atmosphere by the other forms of the apparatus.

If it is desired to use the evaporating chamber without the admission of air, and work under a vacuum or partial vacuum, the evaporating chamber is closed and the discharge end of it is connected to an air-pump, fan, or exhauster, which will serve to remove the aqueous vapour and maintain the required vacuum or partial vacuum.

THE USE OF TAR IN ROAD MAKING.

The City Surveyor of Melbourne (Mr. A. C. Mountain) has been making extensive experiments in connection with the use of tar in road making; and his reports on the subject are decidedly interesting, and suggest a further outlet for this low-priced article. The use of tar in road work is a long way from being new; but we do not remember to have seen its employment in precisely the Melbourne manner advocated before.

It is, of course, used in the city in connection with wood paving; but it is the trials that have been made to determine its utility for macadamized roads that is the fresh feature. Tarred metal roads (Mr. Mountain reports) were formed in parts of Collins, Spring, Bourke, and Leopold Streets, by means of topping the ordinary metal with screenings in the usual way. This, he says, makes a very nice surface for light traffic. But a new departure was made (consequent on the success of an experiment on St. Kilda Road) while re-metalling portions of Swanston, King, Bourke, Little Collins, and Little Flinders Streets, with the view of uniting all the strength and durability of a solid macadam road and the advantages of a tar pavement, without going to any great expense. The method followed was to replace the old road metal with a sheet of new clean metal which, after being well rolled, was bound with coarse, dry screenings, then re-rolled, and afterwards coated with hot tar. Dry sand was then spread over the surface; the hot tar being allowed to work its way thoroughly among the screenings and metal. So far as the experiment has gone, the prospects are very favourable. The road surface—while not so smooth in appearance as if it had been coated with fine screenings—presents all the solidity of the ordinary macadam, consolidates more quickly, and certainly minimizes the production of mud or dust. A more extended application of this simple principle is recommended for St. Kilda and for Sydney Roads this year. The excessive use of tar in Collins Street caused some discomfort; but Mr. Mountain says upon this point: The present condition of that street, both in windy and hot weather, should cause the public to remember it was worth taking some risks of temporary discomfort to secure later on such an improved carriageway as is now available for general traffic; more especially as there is the assurance that the error recently made will not be repeated.

In connection with the use of tar for road work, the Corporation have laid down a tar-distilling plant, consisting of two stills of a capacity of 1100 gallons each; and the following is the return of the cost of distillation between January and August, 1903.

81,000 gallons of crude tar (deprived of ammoniacal liquor, naphtha, and the necessary percentages of light oils) produced 68,780 gallons of refined tar at a cost of £351 3s. 10d., or 4·18d. per gallon.

The residuals were:—

6342 gallons of ammoniacal liquor, costing to produce	£182	5	6
1133 " of naphtha	32	11	6
4744 " of light oils	136	6	10
	£351	3	10

Being an average cost of 6·9d. per gallon of distillate.

Mr. Mountain suggests that additional saving in cost could be effected by further treating the residuals to obtain disinfectants. The loss on the whole business, he estimates, is only £45 15s. 8d.

PERSONAL.

Mr. J. D. Ashworth, the Engineer of the Portsea Island Gas Company, has been appointed, in addition, General Manager of the Company.

Consequent upon the resignation by Sir Edward Lawrence of the chairmanship of the Liverpool United Gas Company, as mentioned in the course of the report of the proceedings at the annual meeting of the Company which appears elsewhere, Mr. H. Wade Deacon, the Deputy-Chairman, has been appointed his successor; while Mr. J. Ernest Tinne will take the position vacated by Mr. Deacon.

It may be remembered that, at the recent annual general meeting of the East Surrey Water Company, Mr. J. Rathbone Downes, the Engineer, Manager, and Secretary, notified his intention of retiring, after 36 years' service. We learn that he will relinquish his position on the 30th prox., and be succeeded by Mr. A. E. Cornewall-Walker, who for the past seven years has been his Deputy and Assistant. We are pleased to find that Mr. Downes will not entirely sever his connection with the Company, as he has accepted the honorary distinction of Consulting Director, unanimously conferred upon him by the Board.

OBITUARY.

The last number of the "Journal für Gasbeleuchtung" contains an obituary memoir of Herr Julius Horn, the Manager of the Augsburg Gas-Works, who died on the 28th of May, aged 50. After serving in the office of the German Continental Gas Company at Dessau, and an engineering works at Augsburg, the deceased was Manager of the following gas-works in turn: Rosenheim, Regensburg, and Augsburg, to the latter of which he went in 1895, and remained there until his death.

The death is announced, on the 29th of June last, at the age of 59, of Herr Edmund Kühnell, the Superintendent of the Grasbrook Gas-Works at Hamburg. The deceased's career had been an eventful one. He came of a family of gas engineers, and started work by assisting his brother in the construction of the gas-works at Trieste in 1865. Then, under his father's direction, he erected the Rathenow Gas-Works. In 1868, he entered the service of the Phœnix Gas Company in London, but left in the following year for an engagement under Messrs. Alexander Aird at Berlin. He took part, as sub-lieutenant, in the Franco-German War, and was twice wounded. At the close of the war he returned to service with Messrs. Aird, and was engaged in constructional work until 1882, when he obtained the appointment at the Hamburg Gas-Works, which he held until his death. He was recognized throughout Germany as an authority on questions relating to sick clubs, workmen's insurance schemes, &c.

Public Lighting in Germany.—According to some particulars obtained from a German directory of gas companies for the current year, published in the "Journal des Usines à Gaz," out of 980 towns, the public lighting is entirely by incandescent gas in 726, and partially by this system in 94. With regard to the remaining 160, in one case the lighting is done solely by electricity; and in the rest the system is not stated.

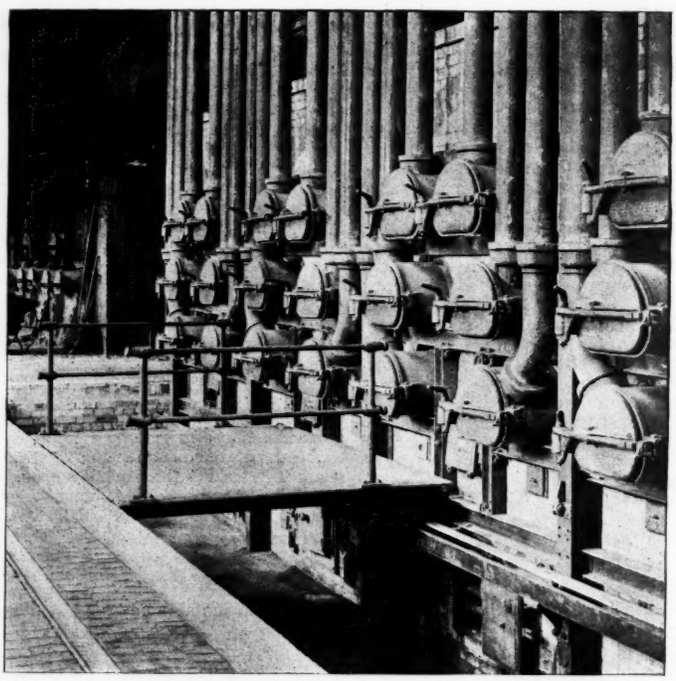
Inverted Gas-Lamp Litigation.—It will be within the knowledge of many of our readers that some time since various actions were commenced by the New Inverted Incandescent Gas-Lamp Company, Limited, to restrain the sale of what were alleged to be infringements of their patents. In connection with one of these actions, a settlement has been arrived at, as will be seen from the following letter (dated Aug. 19) from the Managing-Director of the "Star" Inverted Incandescent Burner Company, Limited, of 104-5, Great Saffron Hill, E.C.—"We beg to advise you that the action some time since commenced by the New Inverted Burner Company against this Company for infringement with a view to stop the sale of the "Star" inverted patent burner has been withdrawn, and an amicable settlement been agreed upon, with the result that a final settlement of all matters in dispute has been at once arrived at, and an agreement embodying the terms of such was duly signed this week by the representatives of both Companies." Whether there will be the same peaceful ending to the other actions is not yet known.

A TRAVELLING PLATFORM OVER A RETORT-HOUSE SUBWAY.

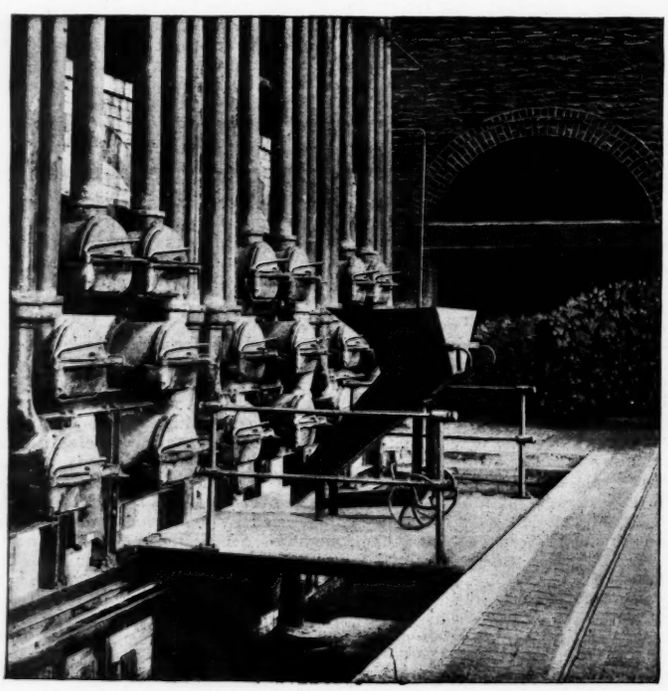
The Galashiels Gaslight Company have recently completed the installation of new carbonizing plant in their works at Galafoot. It is a point for remark and commendation that the whole of the work, including the dismantling and demolition of the old benches, has been carried out with considerable despatch; operations having only been commenced by the Contractors (Messrs. R. Dempster and Sons, of Elland) as late as February of this year. But, though noticed first, the promptness with which the work has been executed, is not its most imposing feature. There is novelty to be found here. Instead of the subway in front of the retorts being roofed in to form a floor for the workmen during charging and drawing operations—a plan universally adopted in works of similar size—the Galashiels subways are left open their full width from end to end, which exposes to view the entire front elevation of the benches, with all mountings such as clinkering-doors, primary and secondary adjustable air-slides, steam and water pipes, sight-holes, &c. This is seen in the photographic illustrations.

The advantages attaching to such an arrangement will be obvious to every gas engineer; but the necessity of maintaining a substantial floor for working purposes in front of the settings, while at the same time endeavouring to dispense with it for an ulterior object, looked the very acme of impossibility. But at length adequate means have been found, whereby the subterranean "Inferno" of the furnaces has been restored, if not to the air of heaven, then, at least, to the cooling influences of a high-roofed, well-ventilated retort-house.

To be brief, Mr. Francis Scott, the Company's Engineer and Manager, in conjunction with Messrs. Dempster, have invented and patented an appliance whereby all the solid advantages of the old permanent floor system are preserved, without any of its drawbacks. The invention, it is stated, fully realizes all the advantages claimed for it. It is nothing more than a travelling platform. Along rails carefully trained to the sides of the subway, and secured with suitable brackets, &c., the platform—its surface level with the retort-house floor on one side, and projecting under the retort mouthpieces at the other—can be moved the entire length of the benches, with the slightest effort. As to the constructive character of the platform, it is about 11 or 12 feet long, to suit the width of the ovens, and is framed together with T-iron, and covered with chequered steel plates. This table is carried on four single-flanged wheels, with ball bearings, and travels on the rails already mentioned. The use of ball bearings, coupled with the single-flanged wheels (thereby reducing friction to a minimum), no doubt accounts for the remarkable ease with which the contrivance is moved to and fro, along the subway. The platform is kept securely in position during charging and drawing operations through the agency of a latch fixed to every alternate buckstay, which drops into a clutch on the edge of the table when the platform arrives at the proper position in front of each setting. The appearance of the benches is greatly improved; the effect of the wholly exposed front elevations, from the floor of the subways to the bridge-pipes, being singularly imposing. It may be mentioned that the edge of the platform will, by and by, be protected by posts opposite each buckstay, and loose side chains hung between.



The advantages realized by, and claimed for, the new arrangement—practical, economic, and hygienic—may be summarily detailed as follows: Clinkering can be accomplished with the minimum of discomfort; the men always having a free circulation of fresh air around them. This is a very different state of things from those prevailing in covered subways, where the heat is intense, and the atmosphere suffocating. The ashes and clinker can be easily thrown from the subway-floor into a barrow on the platform, or on to the retort-house floor. Again, the workmen have ample room to move about, and are able to throw the wet ashes to any place they find most suitable. This is an advantage over the covered subway system, where the ash, clinker, &c., has to be thrown up through the narrow centre space opposite each arch—thus necessitating the removal of the chequered steel plates composing the roofing.



Furthermore, the open subway lessens the danger of scalding accidents to the workmen when tending the producers. The liability to this danger is thus averted, as any accidental precipitation of hot clinker or coke into the ash-pans, with the consequent outrush of scalding steam, is rendered practically harmless, owing to its upward escape into the open space of the retort-house. The water supply to the grate-bars and ash-pans can be seen by any of the Company's servants passing in front of the retort-bench, and can be checked or augmented at the taps above the retort-house floor level, without having to go down into the subway. It is a common occurrence in covered subways—where for hours, sometimes, no attendant ever enters—to find ash-pans flooded over, and the whole of the interior filled with steam and sulphurous vapours.

It is also believed that the open subway will tend to the preservation of the brick and iron work. In covered subways, it is not an uncommon thing to find the walls, buckstays, &c., for a foot or two above the floor-level, corroded and eaten away by the disintegrating action of steam and water. The open subway can at all times be seen by the management, who have thus an opportunity of making sure that all is kept clean and in order. Covered subways are often cramped, dirty dungeons, and about the last place that a gas manager cares to enter.

To sum up, the open subway, with the travellin platform, is, in the opinion of those who have ha

experience of it at Galashiels, superior in every respect to covered subways, or tunnels of any kind. The advantages to the workmen and management are found to be mutual, and thereby the system contributes to greater efficiency all round. Perhaps, too, this point will not weigh lightly with most gas engineers: The capital outlay for an open subway, with travelling platform, is considerably less than for the usual permanently roofed subway. The departure is certainly a very interesting one.

SIMPLE LIGHTING AND EXTINGUISHING ARRANGEMENT FOR LARGE ESTABLISHMENTS.

An office clock, a single and small additional piece of clockwork mechanism, with electrical connections to the clock, are sufficient for the automatic igniting and extinguishing of the whole of the lights in a large business establishment, factory, railway station, market, or any other place, at any given hours for which the clock is set. This appears a simple system, and it is so. Its simplicity, too, reflects its comparative inexpensiveness in installation.

FIG. 1.

The clock is of an ordinary type, such as is customarily used in an office. Around the periphery of the dial a rail is fixed, and on this rail are fitted two contact arms, a number of which, by the way, are shown in fig. 1. These two arms can be placed over any of the figures on the clock as desired—say, one at 4 o'clock when it is required to light up, the other at 9 o'clock when it is desired to extinguish the lights. These contact arms are arranged with their end surfaces inclined towards the direction from which the hands of the clock are travelling; and, as the hour-hand passes over one arm set (say) at four, it completes the electrical circuit with the additional piece of mechanism fixed a short distance away, puts it into operation in the manner to be described, and causes the whole of the burners in the place to be ignited. Then when the hour-hand passes over the second arm fixed at (say) 9 o'clock, it again operates the additional piece of mechanism, with the result that the whole of the burners are extinguished. The point will at once occur to one, how is the lighting up avoided during the similar hours of the night when the lights are not required? This is simply arranged. It has been mentioned that the surfaces of the contact arms are inclined towards the travel of the hands of the clock. The passage of the hands over, and in contact with, the arms has the effect of inclining them in the contrary direction, so that in the night when the hands of the clock synchronize with the arms again, they pass underneath and not over them; and this, at the same time, sets the inclination of the arms in the proper direction for the lighting up and extinguishing on the following day.

The small additional piece of mechanism which is put into action by the contact of the clock hour-hand with the arms as described, and which is situated a short distance from the clock, is shown in fig. 2; but it is to fig. 3 to which we must first draw attention. This is a small connection let into the gas service-pipe supplying the premises; and it contains a valve which opens and shuts off the gas supply to the premises. It is at this point that the whole of the required mechanism ends. It will also be observed that this junction-piece is formed with a bye-pass; and this permits sufficient gas to flow for feeding the bye-pass jets on the burners throughout the premises. Now for fig. 2. This is a piece of strong clockwork mechanism, which requires winding only once a fortnight, and which is connected up electrically with the clock. When contact is made between the clock hour-hand and the first arm, it puts the mechanism (fig. 2) into action, causing the valve in the pipe junction-piece to be opened, and admitting the full supply of gas to the premises; when the clock hour-hand passes over the second contact-piece, the mechanism is again set in motion, with the reverse effect of closing the valve, and completely shutting off the ordinary gas supply to the premises, leaving only sufficient gas flowing through the junction bye-pass to support the burner igniting-jets.

We have said that the mechanism ends with the valve in the junction-piece. That is true. But the question will occur, how is the bye-pass gas prevented from escaping by the ordinary way through the burners? This is accomplished by merely supplying the top of the inner tube of each burner—"C" Kern, or other type—with a small mushroom valve, which is raised from its seat when the full pressure of the gas comes on, and returns to it, sealing the central passage of the burner, when the valve in the service-pipe junction-piece is closed. When the gas supply is automatically turned on as described, the burners are ignited by their bye-pass jets. When, through any exigency—such as a fog—light is needed at times not allowed for by the setting of the clock, it can be obtained by the use of press buttons provided in proximity to the mechanism, which will put the latter into operation in precisely the same manner as the clock.

It will be seen that the possibilities for usefulness of this lighting and extinguishing arrangement are manifold; and the advantages in large industrial premises especially are manifest. There is the saving of labour in lighting and extinguishing, the prevention of the waste of gas, and, what is of great consequence, the danger from leakage of gas, through carelessness or accident, during the hours the premises are closed is completely averted, as, beyond the junction-piece, there is no gas flowing excepting the insignificant amount needed to maintain the bye-pass lights. The arrangement should also be found of use in shops where it is desired to continue to illuminate the window after closing time; and it is suggested that it might also be brought into service by gas suppliers for encouraging a day consumption of gas at special prices in industrial premises closing at dusk. The clock when set could be placed under lock and key, so that gas could not be obtained after certain hours. This is a suggestion the result of actual practice in Brunswick and other cities on the Continent. It is intended by Messrs. A. & E. Cohen, of 2, Bury Street, St. Mary Axe, E.C., who are introducing the new arrangement, to exploit the invention directly through the gas undertakings of the country. Its efficiency has been demonstrated to us at the offices of the firm.

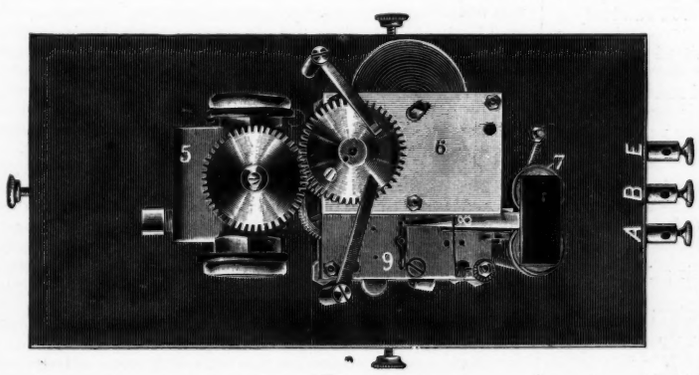


FIG. 2.

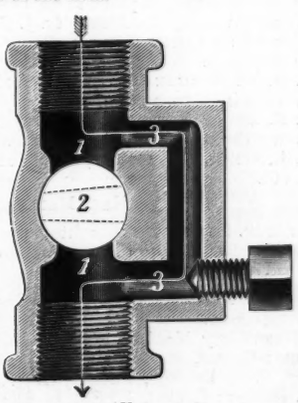


FIG. 3.

Quantitative Analysis of Cyanides in Illuminating Gas.—In the "Bulletin de la Société Chimique de Paris," M. Fieschi describes a method for the above. He runs 100 litres of gas through three washing-flasks containing a mixture of 20 c.c. of ferrous sulphate (10 per cent.), 20 c.c. of caustic potash (30° Baumé), and 10 c.c. of distilled water. The contents of the three flasks are then poured into a globular receiver graduated to 250 c.c., and the volume completed with water. The liquid is then filtered, and 50 c.c. of the filtrate acidified with 10 c.c. of sulphuric acid, and titrated with a sulphate of zinc solution until complete precipitation of the potassic ferrocyanide as ferrocyanide of zinc has been effected. A perchloride of iron solution is employed as an indicator. The sulphate of zinc solution should contain per litre 16 grammes of crystallized zinc sulphate, 7·8 c.c. of sulphuric acid at 66°, and be titrated with a pure potassic ferrocyanide solution. The cyanide in the gas is calculated from the zinc sulphate employed.

IRISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Armagh.

The Annual Meeting of the Irish Association of Gas Managers was held in the Lynn Hall, Armagh, on Tuesday last—Mr. J. Whimster, of Armagh, the President, in the chair. Mr. Whimster's popularity among his colleagues was sufficient to secure a more than ordinarily large attendance.

Welcome to the City.

The President, in opening the proceedings, said he wished to introduce to them Mr. W. J. Best, J.P., the Chairman of the Armagh Gas Company, and Mr. R. G. M'Crumb, J.P., one of the Directors, who had kindly come there to welcome the Association to the city, before they began their regular business.

Mr. Best said that, as Chairman of the Armagh Gas Company, on behalf of his brother Directors and himself, he begged to offer them a very hearty welcome to the ancient City of Armagh. Being market-day, they could not avail themselves of the pleasure of showing the members round the different places of interest about the city. No doubt, Mr. Whimster would attend to that. After seeing the sights of the city—including the two Cathedrals, if time permitted—they might drive out to Milford, which would be most enjoyable. There they would see the extensive linen factory of Messrs. M'Crumb and Co., in which employment was given to about 500 hands. They would, no doubt, visit the Armagh Gas-Works. They might appear to be small, when compared with the large works in which some of them might have an interest, but they had been extended and greatly improved under the able management of Mr. Whimster. He hoped they would spend a very pleasant day in Armagh.

Mr. M'Crumb said he had only to reiterate what had been said by the Chairman of the Company; and if the members could see their way to pay his factory a visit in the evening, he should be very happy to see them.

Report of the Committee.

The Report of the Committee, which was read by the Secretary and Treasurer *pro tem.* (Mr. J. G. Tooms, of Waterford), stated that, under the presidency of Mr. J. G. Tooms, last year's meeting, held in Waterford, was well attended, and was most successful. This year's meeting at Armagh promised to be equally successful. Professor Vivian B. Lewes was to give a lecture to the Association on "The Carbonization of Coal for the Production of Illuminating Gas." From the high reputation of the lecturer, the Committee anticipated that this item itself should ensure the success of the meeting. The Committee had had under consideration the question of affiliation of the Association with the Institution of Gas Engineers; and the recommendations of the Special Committee (of which their President was a member) which had been adopted by the Institution, and copies of which had been sent to each member, would have to be considered. The Committee were of opinion that they, as an Association, ought to adopt them, and thus become associated or identified with the Institution in their work. The abstract of accounts and Auditors' report were presented, and showed a balance of £52 15s. 2d. in hand. Two Members of the Committee had left Ireland during the year—Messrs. S. B. Langlands, of Coleraine, and G. W. Young, of Tralee—and they had to fill their places, as well as to elect three members in place of those retiring according to rules. The Committee regretted that Mr. J. Chisholm, of Glasgow, who was elected an extraordinary member last year, died suddenly a few months ago.

Mr. G. W. Norman (Dublin), the Auditor, submitted the annual accounts of the Association.

Mr. R. Bruce Anderson (London) said he had much pleasure in moving the adoption of the reports.

Mr. J. Nisbet (Portadown) seconded the motion; and it was agreed to.

New Members.

The Hon. Secretary submitted the following names as applicants for admission to the Association, and moved that they be admitted:—

Ordinary Members.—Jones, W., Carrick-on-Suir; MacIntyre, D., Dungannon.

Extraordinary Members.—Fisher, John, Manchester; Steel, W., Athlone; Cairns, R. M., Glasgow; Anderson, J. A., Greenock; Hislop, R. F., Paisley; Phelp, J. R., Richmond, Surrey; Knight, C. P., Belfast; Leckie, T., Edinburgh; Sugden, F. C., Leeds.

Mr. G. Airth (Dundalk) seconded; and the motion was agreed to.

Election of Office-Bearers.

The President said he had very much pleasure in proposing that they elect Mr. Airth, of Dundalk, their Vice-President, to be President for next year.

Mr. R. Harrison (Monaghan) seconded, and the motion was agreed to.

Mr. Airth thanked the members for the honour they had conferred upon him. He might say it had not surprised him, because he believed that the Vice-President in any year was the unfortunate individual to be elected President for the following year. He had much pleasure in proposing that Mr. R. Bruce Anderson of London, be elected Vice-President.

Mr. P. Conroy (Galway) seconded. One reason for having a gentleman like Mr. Anderson as President the following year was that they were going to have a National Exhibition in Dublin; and, as Mr. Anderson had no fixed place of residence in Ireland, Dublin would be an appropriate place for holding the meeting.

The President thought they could not make a better selection. They were always glad to have a gentleman who was an eminent Engineer among them; and he had no doubt that Mr. Anderson would receive the right hand of fellowship at what was proposed as the Dublin meeting.

The motion was agreed to.

The President said the Committee nominated Mr. D. W. Tooms (Fermoy) and Mr. G. Cummings (Ballymoney) to fill the vacancies on the Committee which had been created by the two gentlemen who had left Ireland.

Mr. D. Williamson (Clones) proposed, and Mr. J. Brodie (Omagh) seconded, the election of these gentlemen, which was agreed to.

The following gentlemen were elected as new members of the Commtttee: Mr. J. Richmond (Kilkenny), Mr. D. Reid (Ballina), Mr. T. Frizelle (Holywood).

Mr. Anderson said, before they proceeded further, he would like to thank them for the honour they had done him in electing him Vice-President. He was not like Mr. Airth, for he was very much surprised indeed when the Secretary communicated to him that morning that it was their intention to elect him. He could only say that, whatever shortcomings might be found in him, he would do his best to perform the duties of the office.

Mr. Tooms proposed that Mr. James Whimster (Armagh) be elected Hon. Secretary and Treasurer. It was generally understood that Mr. Whimster was the permanent Secretary and Treasurer; but seeing there had been a break in the office, it was almost necessary to propose that he be elected.

Mr. Frizelle seconded; and the motion was agreed to.

The President said that as Mr. Norman had so well and faithfully performed the duties of Auditor for a number of years now, they could not do better than re-elect him. He had great pleasure in proposing that they re-elect him.

Mr. F. Eustace (Tullamore) seconded; and the motion was agreed.

Place of Next Meeting.

Mr. Airth invited the Association to hold their meeting next year in Dundalk.

Mr. A. Mackenzie (Edinburgh) moved, and Mr. Brodie seconded, that the meeting be in Dundalk, which was agreed to.

Inaugural Address.

The President then delivered his Inaugural Address. This was given in our issue last week, p. 456.

Mr. Airth moved that a hearty vote of thanks be given to the President for his really excellent address, which he so wittily started, but got into good matter afterwards. He considered it was one of the most pleasant addresses he had ever heard in the Irish Association, and he had attended five meetings now. He was not allowed to make comments upon the address; but he was glad that Mr. Whimster did not go into any of those learned professional subjects which they got in addresses from Presidents of Associations on the other side, but had kept to the matter which, to those who were Managers of small gas-works in Ireland, were the very things they wanted to get hold of. They would be able to read the address, and to cull from it matter which they were not able to take at the time the President was reading it.

Mr. Anderson had much pleasure in seconding the motion. As Mr. Airth said, they were not to discuss the address; but, nevertheless, they could, he was sure, appreciate the way in which the President had kept down to their level, and had given them things they could make use of in their works, rather than going into matters which could only be of academic interest to many of them.

A Medal for the President.

Mr. Airth said there was more than a vote of thanks. They felt that they could not let this occasion pass without trying to show, in a small way, their appreciation of the President's ever-ready and honorary services to the Association, both as its Secretary and Treasurer and as the founder of it. The Committee, therefore, thought it right that they should make some little present to him, to show their appreciation of his services for the long period of seventeen years; and he was proud to think that Mr. Whimster should be the first President who would be presented with the President's medal, which he had great pleasure in presenting to him.

[Mr. Airth then placed a blue ribbon carrying the medal round the President's neck. The medal has, within a raised outer ring,

an ornamented circle of shamrock leaves, and in the centre the monogram of the Association; and on the reverse side the inscription: "Presented to Jas. Whimster, Esq., Armagh, by the Irish Association of Gas Managers, at the Annual Meeting held in Armagh, 16th August, 1904."]

The PRESIDENT said the matter had been sprung upon him as a surprise; he did not know how they had managed to keep the secret so well. He gathered from Mr. Airth's last remark that he was not to be the last President to get the medal, but that they were to follow the lead of the North British Association in this matter, and present a medal to their Presidents in the future. He was very thankful for their having made him the first President to receive the medal. He had always had the interests of the Association deeply at heart; and he was very proud to see such a grand gathering there that day. He thanked them most heartily for their vote of thanks, and for this expression of their goodwill.

THE QUESTION OF AFFILIATION.

The HON. SECRETARY read the proposed terms of affiliation with the Institution of Gas Engineers, and formally moved that they enter into the affiliation.

The PRESIDENT said he had much pleasure in seconding the motion. It was open to any member to move an amendment, if he thought they ought not to affiliate—and then, of course, a decision must be arrived at by vote. But there was one thing he should like to say before they went further, and that was that all the District Associations in England had agreed to affiliate. The only Association that had turned its back upon the scheme was the North British; and a good many of them thought it very strange that the North British Association should take up that attitude. But they might follow the English Associations, without following the other; and what he was going to say was that it did not bind them entirely. Although they went into the affiliation, if they thought after a few years that it was not worth their while, they could separate again. But it was well worth giving affiliation a trial.

Mr. F. EUSTACE (Tullamore) said he would like to know what they were really going to get for the five guineas.

Mr. TOOMS did not think that anyone could say that the Association, as an Association, were going to get anything in equivalent value; but in the case of younger members of their Association who might desire to become members of the Institution during the next twelve months, they would save a guinea. He knew some who intended to join, and who would save the guinea. It was a question for the Association to consider whether they preferred to pay the five guineas on the supposition that they might get some benefit. Their funds were in a good state, and that for one thing was favourable to affiliation, in his opinion; and it would make the office of President of their Association a much more honourable one in future, inasmuch as the President would be their representative, he took it, on the Council of the Institution—the premier Council in the world of gas engineers, He thought that was of some value to the Association. If they. as an Association, wished to bring anything before the main body, they would be able, through their representative, to bring it before them in a much better way than they would if they held aloof from the Institution.

Mr. J. H. ROBERTS (Newtownards) asked if every gas manager in Ireland, as he stood, would be eligible to become a member of the Institution on the terms as stated.

The PRESIDENT: Yes.

Mr. R. HARRISON (Monaghan) asked if it would be competent for the Institution to object to any of their members becoming members of the Institution.

The PRESIDENT: No; but the members must come within the rules of the Institution, certainly.

Mr. T. J. REID (Ballina) gathered from the remarks of some of the members that they had an idea that it would be necessary to be a gas manager in Ireland, before they could be a member of the Institution. He understood that any gas manager might be proposed as a member of the Institution.

The PRESIDENT said that was so; but the advantage to members of their Association would be that they got admission without the entrance fee.

Mr. D. WILLIAMSON (Clones) pointed out that they might be accepted, or they might be rejected.

The PRESIDENT understood, from the reading of the last condition, that that was not so. The last of the terms was that members of each District Association who were qualified to become members under the Articles of Association of the Institution, should be eligible. This excluded the extraordinary members. This was what it was meant for, because it was a great stumbling block in the way of an agreement about affiliation that the Institution had no extraordinary members, but the District Associations had; and so it came to be worked out in this way—that the Institution, if they affiliated, had nothing to do with their members at all, but that their ordinary members who came under the rules of the Institution, would be received into the Institution without entrance fee during a period of twelve months. He might tell them that at the conference this point was brought forward, because there was no period of twelve months put in during which members should be received without entrance fee. This left it open to anyone who wanted to get into the Institution to make use of a District Association for this purpose, by joining one of them, paying a year's subscription—say, 5s., and then leaving the District Association. It was open to this abuse; and the condition as to twelve months was put in. It was difficult just to say what would be the specific advantages; but he thought it was well worth a trial. Surely they could not be associated with the larger body without some advantages accruing.

Mr. R. BRUCE ANDERSON (London) supported the motion. It had, he said, been asked what good they were going to get from the five guineas' subscription. Well, several instances occurred to him in which they were likely to participate in benefit. In the first instance, the more they strengthened the Institution the better representation they would have in Parliamentary questions. Although, formerly, there were several Associations throughout the country almost equally powerful, when anything was to be done before Parliament they expected the Gas Institute to take it up. So if they strengthened the Institution by joining it along with the English Associations, there was not the least doubt the Scotch Associations would come in soon. There were various things they had now to face. They had had troubles over the photometrical power of their gas; but Parliament had been gradually relaxing the stringent conditions under which gas had to be manufactured, so far as candle power was concerned. But what was the next bugbear? Calorific value would be a worse bugbear, in his opinion, than illuminating power had been. How were they going to prevent afflictions of this sort coming upon them? By having a strong body to deal with them. They could get the Institution to take up this question of calorific value. Another matter was the education of gas engineers. This was a very important matter, and the Institution were the body which would naturally take it up. There was no doubt that when the funds of the central body had increased, opportunities would be afforded to gas engineers to improve themselves. Then, in any matter which affected them locally, they could make a stronger representation through the Institution than through their own Association. Mr. Eustace had touched upon what were to be the advantages to the individual members. It was difficult, probably, to point out any immediate profit to the members; but the question of the future remuneration of gas managers was one. Frequent applications had been made to the Board of Trade by governing bodies for transfers of gas undertakings. In some Bills special provision had been made for remunerating the old manager; but it depended simply upon the good will of the Directors whether they got the clause or not—and even then there was often opposition. If they strengthened the Institution, they might arrive at some basis—perhaps on Civil Service lines—under which the manager of a gas-works transferred to a local authority and not continued in office would be properly remunerated. This question touched the individual pockets of a good many managers, and well deserved attention, he was sorry to say. Looking to the other side of the question, as far as he could see the only loss they would have was that of the five guineas annually. But were they to lose by that? He thought not; and if at the end of a year, or any other period, they did not find it to be satisfactory, they could drop the matter, and there would be an end of it. Therefore, he strongly urged all of them to pass the motion unanimously, so that they might derive some of the advantages he had mentioned; and very likely there would be others he had not thought of.

Mr. EUSTACE said that when he asked the question as to the advantages to be gained, he wanted to find out if their ordinary members were eligible for election.

The PRESIDENT said that, so far as he understood, they were.

Mr. EUSTACE: And the fee covers the entrance fee of all our members.

The PRESIDENT: They will, of course, have to pay their annual subscriptions.

Mr. TOOMS explained that if they paid their guinea subscription they would not require to pay an entrance fee of one guinea. Another matter was that their President would often have to go to London; and the five guineas would help to cover his expenses. It was not likely that their President would care to go to meetings in London at his own expense; so that the Institution would have to pay his way. He did not think, therefore, that the Institution were to get anything out of the five guineas so far as he could judge.

The PRESIDENT said it was in this way—they would have the right, if they affiliated, to elect a member of their body to be a member of the Council of the Institution for the year. It might be the President, or it might be another; but whoever was elected might be summoned to London, and the Council would need to pay his expenses.

Mr. M. DUNN (Stockton) said he had certainly listened to the discussion with much interest; and so far the matters spoken to had been well brought out. With reference to the vital point about their delegate—as to his expenses to London—it was the custom of the Institution to pay all delegates their fares. He happened to be a representative appointed by the North of England Gas Managers' Association; and in every instance in which he had attended Institution Committee meetings—some of them very hurriedly—he had, within a few days, received a cheque from the Institution covering first-class railway return expenses. The five guineas was a paltry sum, and would give them direct representation on the Council; and their grievances, or anything else they would like to ventilate, would be directly ventilated.

Apart from all advantages, the fact that the Institution would, in every instance, permit their members who were *bonâ fide* managers or engineers of gas-works to become members of the Institution, was worth something. If there were a doubt about anyone not being a *bonâ fide* gas manager, he would advise him not to apply. It did not follow that if they applied as members of the Association they would not be balloted for. They were bound to go through the ballot; but there was no fear of anyone being rejected if he were a member of the Association.

The PRESIDENT said, seeing there was no amendment, he must put the motion proposed by Mr. Tooms, seconded by himself, and supported by several of the members—"That they agree to affiliation with the Institution of Gas Engineers, on the terms sent down in their report."

The motion was adopted unanimously.

The PRESIDENT said he was very glad that they had come to this position. He thought it would put them in line with other Associations.

VISIT TO THE GAS-WORKS.

The meeting adjourned for an hour, during which a visit was paid to the works of the Armagh Gas Company. The members were received and entertained by Mr. and Mrs. Whimster, and spent some time in examining the works, which were found to be in all departments, in first-rate condition.

LECTURE BY PROFESSOR VIVIAN B. LEWES.

On resuming,

The PRESIDENT said it became his very pleasant duty to introduce to them Professor Vivian B. Lewes. He was a stranger to their Association; but he was no stranger to Armagh. Professor Lewes had been there before. He had heard him lecturing within a few yards of that place; and he was sure they should have a great treat that day. While they had to do with the practical part of gas making, Professor Lewes had devoted a great deal of attention to the theoretical work in connection with the process. He supposed some of them had often wished that they could have glass doors on the mouthpieces, so that they could see what was going on inside during the four or six hours' duration of the charge. Now, he thought, Professor Lewes could almost do that, for he had studied the subject of carbonization so thoroughly that he could almost say what was going on inside a retort while the charge was being worked off. He was sure they would all listen to Professor Lewes with great interest, and he had much pleasure in introducing him.

THE CARBONIZATION OF COAL FOR THE PRODUCTION OF ILLUMINATING GAS.

Great as have been the strides forward in many departments of the manufacture of coal gas, the changes which have taken place in the actual carbonization have been small indeed; and it has only been within the last twenty years that attention has been turned to this, the most important operation in the production of coal gas. Before any clear idea can be formed as to the work which has to be actually done, and the way in which it can best be carried out, it is essential to consider what we know as to the composition and character of the coal we use, and how the material at hand can best be treated to give the desired results.

Coal itself is a substance of purely vegetable origin, having been derived from the woody fibre of plants by chemical actions taking place under the influence of heat, pressure, and varying degrees of moisture, which have resulted in the formation during long ages of a compound so complex that all the researches of modern science have failed to give us any definite knowledge as to the actual compounds present in it, although its ultimate composition is easily determined. It seems highly probable, as has been suggested by Dr. Phipson, that in the early days of the earth's formation, when a nebulous mass of incandescent matter was shrinking and hardening into a world, our atmosphere existed, not as it does now of a mixture of practically four parts of nitrogen to one of oxygen with attendant impurities, but that the great conflagration of matter had left it a mixture of the two products of combustion, carbon dioxide and water vapour, together with inert and unburnable nitrogen—an atmosphere in which animal life was an impossibility, but which contained all the requisites for marvellous activity in the vegetable kingdom.

As soon as the surface of the earth had sufficiently hardened and cooled to yield a coign of vantage for vegetation, plants commenced to grow with enormous rapidity. Forced by heat from below, fed by an atmosphere specially adapted for their growth, and urged to chemical activity by energy derived from the sun, they increased and grew at a rate unknown in these days, and gave rise to monster forests, which the geologist traces in the fossils of the earth, and which show that the general characteristics of this primeval vegetation were not unlike those of the mosses and other forms of plant life the *habitat* of which is marsh or swampy land. The main difference between the plants of the two periods is that while those of the present day can be measured in inches, the older growth was of enormous size—in many cases reaching a height of 40 or 50 feet. Rapidly as this vegetation grew, it withered and died almost as rapidly; forming, under fitting conditions, beds of peat similar to those produced by the present-day plants, only of far greater thickness.

The woody fibre which forms the main portion of a plant is practically entirely derived from moisture and the carbon dioxide which exists as a normal minor constituent of the atmosphere in the proportion of roughly 4 parts in 10,000 of air; and the processes by which the gaseous carbon dioxide is transformed into the solid woody fibre or cellulose is exceedingly interesting and wonderful. If the leaf of a growing plant is examined under the microscope, the outer skin or cuticle of the leaf is found to contain a number of openings, called "stomata," which are formed by two semicircular cells. These stomata lead into small funnels terminating in glands, which are filled with a green colouring matter to which the name of "chlorophyll" has been given, and which consists of two compounds, one of a bluish, the other of a yellowish-brown colour. Under the influence of sunlight, chlorophyll has the property of absorbing carbon dioxide and of decomposing it together with water vapour, taken in from the atmosphere and the soil, with the result that a new compound of the carbon of the carbon dioxide with the hydrogen and oxygen of the water is produced, called "cellulose," the percentage composition of which is carbon 44·44, hydrogen 6·17, oxygen 49·39.

As long as life exists in a plant, this process of building up cellulose continues; but with decay the reverse action takes place. The carbon of the woody fibre unites with the oxygen of the air to form carbon dioxide, while the hydrogen and oxygen in it combine once more to produce water vapour; and it is easy to see how, in the course of years, a tree may rot and eventually be resolved into its constituent gases, leaving as evidence of its existence a small quantity of mineral matter which had been sucked up by the sap from the soil in which the tree grew. If, however, instead of the cellulose such as existed in the structure of the tree being left to decay in free contact with the air, it is placed under the surface of water or soil in sufficient thickness to prevent the oxygen of the air attacking it, an entirely different set of reactions takes place. The combined oxygen in the cellulose unites with some of the hydrogen and carbon to form fresh gaseous bodies, while the carbon and hydrogen yield small quantities of hydrocarbon gases similar to methane or "marsh gas." A solid body is also produced, which is known as "peat," and with increased temperature and pressure the peat in process of time becomes more dense, forming a substance resembling coal. These were the changes that undoubtedly gave us our coalfields. The vast masses of rotting woody fibre from the rapidly growing and decaying vegetation of the primeval forests would in many cases become submerged owing to the constant changes in the levels of the thin crust of the globe, and a sudden sinkage would be followed by an inrush of water bearing all kinds of solid earthy matters, which quickly formed a thick layer of silt over the decaying mass. This deposit increased and hardened, so that the gases formed during the checked decay of the cellulose were unable to escape, and were stored in the fissures of the coal under enormous pressure—a large quantity also being occluded in the pores of the coal itself. On relieving the pressure during the operation of winning the coal, these gases escape in considerable quantities into the mine, forming when mixed with air the dreaded "fire-damp."

According to the conditions under which the coal has been formed, its general composition will vary; and we can divide the different varieties under three heads—lignite, bituminous coal, and anthracite. So that, starting with the woody fibre, heat and pressure will gradually convert this into peat. In the course of ages, the peat is transformed into lignite or brown coal, which contains the lowest percentage of carbon, but with still considerable quantities of hydrogen and oxygen. Gradually the percentage of carbon increases owing to a corresponding diminution in the hydrogen and oxygen, and bituminous coal results. The next step is the formation of anthracite, the most highly carbonized of the series, and containing but little gaseous matter; while the final stage is the production of graphite or pure carbon. These changes—due to increase in the percentage of carbon and the elimination of hydrogen and oxygen—are well shown in the following table (Percy), in which the carbon is kept as a constant, in order to make clear the reduction in oxygen and hydrogen.

	Carbon.	Hydrogen.	Oxygen.
Wood	100	12·18	88·07
Peat	100	9·85	55·67
Lignite	100	8·37	42·42
Bituminous coal	100	6·12	21·23
Anthracite (Wales)	100	4·75	5·28
,, (Pennsylvania)	100	2·84	1·74
Graphite	100	—	—

Coal is a substance of such complex composition that in the present state of science it is only possible to find out the elements of which it is composed and the proportion in which they are present. But there is no doubt that coal is mainly carbon, combined or mixed with hydrocarbons resembling the paraffins, together with compounds of carbon, hydrogen, and oxygen, and more complex bodies containing nitrogen.

For the manufacture of illuminating gas, the coals best suited for the purpose are of the bituminous class, such as the Midland, Durham, and Northumberland coals; while for enrichment purposes cannel was used to a considerable extent. The ultimate analysis of a coal, showing as it does merely the percentage of the various elementary bodies in the coal, does not in any way afford an indication of its value for gas making; but M. Sainte-Claire Deville has drawn attention to one suggestive point—namely,

that as the amount of combined oxygen in the original coal rises, so does the total amount of volatile matter present in the coal increase, with a corresponding increase in the illuminating value and density of the gas produced from it. His experiments showed that the coal best suited for gas making contained from 7·5 to 9 per cent. of oxygen. Poor gas and a plentiful supply of coke result from a coal containing less oxygen; while the quality of coke suffers with excess of oxygen. In obtaining illuminating gas from our coal, we have to rely upon the process called "destructive distillation," which differs from ordinary distillation in that the products cannot be again condensed into the original substance, as is the case when we have to deal with substances that can be vaporized unchanged by heat and again condensed by cooling.

We have already seen that bituminous coal may be looked upon as carbon combined or mixed with hydrocarbons, some of which belong to the paraffin series, and other bodies of a far more complex character, in the composition of which we find nitrogen, oxygen, and sulphur, as well as carbon and hydrogen. When a body of this character is submitted to destructive distillation, it is found that the nature and yield of the products are affected by several factors, such as the temperature to which the material is subjected during distillation, the length of time it is heated, and the size of the charge. But in any case the products may be divided into three classes—(*a*) solids, as coke; (*b*) liquids, as tar and ammoniacal liquor; (*c*) gases, the unpurified coal gas.

When a low temperature is employed for the distillation of bituminous coal, the tar is found to contain considerable quantities of light paraffin oils, which are derived from the paraffin hydrocarbons originally present in the coal. Under the influence of heat, these split up into more simple members of the series, and into olefines; and taking the action in its most simple form, the gases evolved may be considered as consisting of ethane and ethylene. The simple character of these gases, however, undergoes an infinity of changes as they pass along the retort and are subjected to the baking action of the radiant heat from the already carbonized material and the hot walls of the retort. Under these conditions, the ethane splits up into ethylene and hydrogen, while the ethylene decomposes still further into methane and acetylene, which latter is at once polymerized to benzene and other similar substances. Some of the acetylene, also, losing its hydrogen, condenses to naphthalene; and so by various interactions we get the endless combinations found in the tar and coal gas. The organic substances containing oxygen in the coal, moreover, suffer decomposition, and form the phenols in the tar.

There is very little doubt that the general course of the decompositions follows these lines; but any such simple explanation of the actions taking place, is rendered impossible by the fact that, instead of the breaking down of the hydrocarbons being completed in the coal, and only secondary reactions taking place in the retort, in practice the hydrocarbons to a great extent leave the coal as the vapours of condensable hydrocarbons, and that the breaking down of these to such simple gaseous compounds as ethylene is proceeding in the retort at the same time as the breaking up of the ethylene already formed into acetylene and methane, and the polymerization of the former into higher compounds. Starting with a solid hydrocarbon of definite composition, it would be theoretically possible to entirely decompose it into carbon, ethylene, methane, and hydrogen, and by rapidly removing these from the heating zone before any secondary actions took place, to prevent the formation of the lighter portions of the tar. But in practice this is impossible, as coal is not a definite compound, and it is not practicable to subject it to a fixed temperature.

The temperature of the charge in a heated retort will be found to vary enormously in different parts of the retort. With an initial temperature of 1000° C. the temperature of distillation will vary from about 800° close to the walls to about 400° in the middle of the coal. So also when the gaseous products are distilled off they are subjected to a temperature of 1000° against the sides of the retort, while above the charge they are probably only heated to 600° C. This leads to the formation of two distinct sets of products in the tar—the first due to incomplete decomposition, and the second to the products of the decomposition being kept too long in the zone of heat. Examples of the first class may be found in the light paraffin oils, while the second class may be represented by benzene, naphthalene, and retort carbon. The formation of this second series represents a loss in the manufacture, as their formation in the tar means a corresponding loss of illuminating constituents in the gas; and the naphthalene causes serious trouble in the stopping of pipes with sudden changes of temperature. On further heating, also, these bodies do not yield illuminants of value, and require for their decomposition a temperature which will only break them up into methane, hydrogen, and carbon. The effect produced by alteration in the temperature of the retort upon the composition of both gas and tar is very marked. As the temperature is raised, the yield of gas from a given weight of coal increases; but with the increase in volume, there is a considerable decrease in the illuminating power of the gas evolved—this being due to the fact that, with the increase of temperature, the hydrocarbons, the olefines, and marsh gas series gradually break up, depositing carbon in the crown of the retort, and liberating hydrogen, the percentage of which steadily increases with the rise of temperature.

When Murdoch first made gas at Redruth, in the closing years of the eighteenth century, he employed a cylindrical cast-iron pot with a rounded bottom, sunk in the furnace. But it was soon found that the removal of the coke left by the carbonization of the 15 lbs. of coal employed caused inconvenience; and in 1802 he constructed a horizontal retort. A little later on—in 1804—he reverted to the vertical pot form, but added a tubulure at the bottom for removing the coke; and it was about this period also that he made an inclined retort with lids at either end. The form of the retort, however, soon settled down to the horizontal. This early period was richer in experiments on the subject of carbonization than almost any we have had since, as when once the horizontal retort gave satisfactory results, the only alteration made during the next seventy years was in material, shape, and setting. Since then the "sloper" has been once again introduced, with all its mechanical improvements, and has brought gravity to the aid of labour in charging and discharging, with results which need no discussion. Rotary retorts have also had some short trial. The vertical retort has also now come forward under the auspices of Dr. Bueb in Germany and Messrs. Settle and Padfield in England.

Having discussed the composition of coal and what we want of it in carbonization, we are now in a position to criticize the methods that have been employed and the direction in which improvements may be made. The ideal carbonization of coal would consist in subjecting every particle to a perfectly uniform temperature, so regulated that the decomposition of the hydrocarbons in the coal would yield hydrocarbon gases of the highest possible illuminating value, since whether or not it is desired to make high-power illuminating gas or high-power calorific gas, the best results can be obtained in this way. Having gasified the hydrocarbons, the next essential is to remove them as rapidly as possible from the zone of heat, in order to prevent any secondary actions, which by decomposition or polymerization would break them up into less valuable heating or lighting gases, or polymerize them into liquids or solids which would be lost in the tar. It is at once evident that uniformity of action is really the keynote of success in any process of carbonization.

With the methods of retorting now in general vogue, however, anything even approaching uniformity is an utter impossibility. When the coal is charged into the heated retort, the variation in temperature between the interior of the charge and the exterior is enormously great, while the variations in the actions brought about by heat in the gas evolved are greater still. The gas developed by the coal near the mouth of the retort is quickly washed out up the ascension-pipe by the push of the gas behind, and the period for which it has been exposed to the radiant heat from the walls of the retort is practically *nil;* while the gas evolved in the portion of the retort farthest from the mouthpiece has only its own rate of evolutioa to drive it forward, and has to traverse the longest run possible in the retort, exposed during the whole of that period to radiant heat and to contact with the highly heated surface of the retort itself. The result is that if the gas evolved from nearest the mouthpiece could be collected and tested separately, it would be found to give, with ordinary Durham coal, more than 20 candles per cubic foot; while the gas from the portion farthest from the mouthpiece would register only a few candles at most.

As the carbonization proceeds, it is the outer portion of the charge which is first acted upon; so that after the first couple of hours the charge contains a core of non-carbonized coal, surrounded by a red-hot envelope of coke, through which, as carbonization progresses, the evolved gases have to escape. Contact with this highly heated mass not only has fatal effects, due to overheating, on the quality of the gas, but has this action further exaggerated by the well-known catalytic action which red-hot carbon has upon gaseous hydrocarbons, which causes them to decompose with great rapidity into hydrogen and carbon, a good deal of which at this stage of the process is liberated in a flocculent condition, and tends to the production of stopped ascension pipes; and there is little or no doubt that, even with the best horizontal retort practice, there is a loss of 20 per cent. in the candle and calorific value of the gas owing to the analytic and synthetic actions taking place from the improper conditions under which 80 per cent. of the charge is carbonized.

In the pot still as used by Murdoch, the trouble which was at once recognized was the practical one of removing the coke; but when this had been overcome by making an opening at the bottom of the vessel, and so converting it into practically a vertical retort, it was found that the gas having to flow up from the bottom, which was the hottest part, through the whole mass of material above, caused such deterioration that this form was abandoned in favour of the horizontal, which, bad as it is, still gave results infinitely better than the earlier form. Now that this grave cause of deterioration has been thoroughly recognized, the time is ripe for improvements on rational lines, which should help towards the result we all desire, of providing town supplies of gas of such quality and at such a price as to be economically available for the production of power as well as of light; the development of gas for fuel and power purposes being the great advance to which the industry has to look forward during the present century.

In 1900, in a lecture I gave before the Incorporated Institution of Gas Engineers, I advocated the utilization of water gas and the rapid running off of the coal gas as produced from the retort, and later on showed, by extended experiments, that good results could be obtained if the process were only carried out in a rational

manner. Unfortunately, however, it is impossible to introduce any improvements without treading on the corns of those who are interested in other processes; and as soon as the desire was shown among gas engineers to try to utilize the suggestion, a wild and frenzied wail arose from partisans of carburetted water gas. So successfully has this been engineered, that an impression has arisen that the process is of little practical value. I am quite content, however, to await the outcome of honest experience in the matter, which during the next few years will show that, properly applied, the process will yield results that will render the gas engineer free from the fluctuating factor of oil. In Germany the process has given excellent results at several works; but students of the gas papers will have read within the last few months an attack upon the process, in which, by making water gas in an apparatus intended for other purposes, and by the purely fallacious methods of measuring the results, an attempt was made to prove its want of success. I have within the last few days received a letter from Mr. Drory, of the Mariendorf works at Berlin, who has made a thorough testing of the process—the tests being carried out with the greatest care by the Engineers of the Imperial Continental Gas Association, with the assistance of such well-known scientific men as Dr. Messerschmidt, Dr. Barph, and Herr J. van Eyndhoven—which certainly shows the economic value of the process when carried out in a proper way. These results, I am informed, will be published shortly in the "Journal für Gasbeleuchtung."

A process which in the latter half of last year and the early part of this year attracted a considerable amount of attention among those interested in gas matters, was the vertical retort process of Messrs. Settle and Padfield, which was in operation for some time at the Exeter gas-works, and which showed promise of being one of the greatest improvements in carbonization made since the introduction of the horizontal retort. This process was reported upon and described by severel of our leading experts, and the general consensus of opinion was that it was possible by its means to obtain 13,000 cubic feet of gas per ton of slack, with an improvement in the quality of the coke produced; the larger yield and higher sperm value being obtained at the expense of the tar, which in the process is returned to the retort and again carbonized. In December last I had a chance of thoroughly examining the process at the works; and the whole of the experimental plant being placed in my hands, I took the opportunity of thoroughly testing it. After several days' working, I found that from a ton of Camerton rough slack one could make 13,250 feet of gas of 14·72 candles mean illuminating power and 533·7 B.T.U. heating value, with a yield of 1645 lbs. of coke per ton of coal used—the coke being far superior to the ordinary retort coke; while on carbonizing the same slack in the horizontal retorts, I obtained 9802 cubic feet per ton of 15-candle gas. These results appeared to me to be so important and so extraordinary that I devoted a considerable amount of time and attention to them.

The apparatus consists of a combination of a vertical and an inclined retort, the vertical portion being about 6 feet, and the inclined portion at the bottom about 3 feet in length. The upper end is brought up flush with the top of the setting, and carries the mouthpiece, ascension-pipe, and charging arrangement, while the lower opening at the bottom of the incline comes to the side of the setting, and is fitted with an ordinary flanged mouthpiece for discharging. The charging apparatus consists of a sliding plunger working in a flanged tube, the plunger-rod carrying two cones which fit the tube. Above this charging-pipe is a funnel, which is filled with slack. The plunger during its stroke takes down some of this slack into the tube; and as the lower end of the plunger gets below the bottom end of the tube, the charge of coal falls out, while the upper cone seals the tube. The distance between the cones on the plunger can be so adjusted as to take any quantity of coal, from 2 to 7 lbs. at a time; the advantage of the cone which forms the lower end of the plunger being that it scatters the charge evenly over the area below, instead of letting it drop into one place. This arrangement worked perfectly well; and it is clear that by charging the coal in small portions in this way into the retort the trouble which has heretofore existed of the gases having to pass through a mass of incandescent carbon is avoided, while the temperature of the retort itself can be kept lower than is the case when a large charge of coal is inserted into the retort.

I found that during the working there was a very considerable variation in the illuminating power in the different stages of the carbonization; the candle power varying between 17·63 and 13—a result which I could not reconcile with the uniformity in the action which the process should give. The point that specially attracted my attention was that the volume of the gas should be increased up to over 13,000 cubic feet per ton, while the theory of the process should give a reduced volume of gas, owing to the decomposition of the hydrocarbons being largely eliminated and the decomposition of the tar certainly would not account for the increase in volume found. In order to find out what this meant, I made a number of careful analyses of the gas, and at once discovered the explanation of the phenomenon to be that the retort was leaking badly at the junction between the vertical and inclined portions, and that though the exhauster was working at a very slight pull, yet it was sufficient to draw in something like 14 to 20 per cent. of furnace gas. On correcting the analysis for this dilution, the true analysis of the gas as given by the carbonization was obtained. Two of the original analyses, one taken at the commencement and the other at the end of the carbonization of the charge, show the results obtained.

	A.	Corrected.	B.	Corrected.
Carbon dioxide	0·25	0·30 ..	—	—
Oxygen	0·25	0·00 ..	—	—
Unsaturated hydrocarbons	2·50	3·06 ..	6·00	7·06
Saturated hydrocarbons .	48·95	60 05 ..	44·40	52·29
Carbon monoxide . . .	7·50	4·02 ..	7·50	4·02
Nitrogen	14 00	0·00 ..	11·00	—
Hydrogen	26·55	32·57 ..	31·10	36·63
	100·00	100·00	100·00	100·00

The correction is arrived at by deducting the nitrogen and carbon monoxide over the 4 per cent. which is present in gas made from this class of slack, and recalculating the residual gases to 100. The amount of furnace gas so drawn in will not average less than 15 per cent. of the total make (the carbon dioxide which was in it was taken out by the lime purifiers), and the 13,250 cubic feet per ton would therefore be reduced to 11,262 cubic feet per ton of slack carbonized, which, taking into consideration the gas obtained from the tar, just about agrees with what might be expected on theoretical grounds. So far from damning the process, however, this result makes it of enormous value at the present time. If we look at the corrected analysis, we at once see that the percentage of methane has been largely increased, while the unsaturated hydrocarbons have also risen to a very appreciable extent; and if this gas gives an illuminating value of just upon 15 candles when diluted with inert nitrogen, we may be sure that without such dragging down it would be over 20-candle power. This is supported by the fact that when a charge had just been put in, and gas was coming off so fast as to throw a slight pressure on the retort and prevent any leakage inwards, the candle power at once rose to 17·6; while in Mr. Settle's records there are many tests showing 20 candles.

In the gas practice of to-day, everything clearly points in one direction, and that is that the future of coal-gas is entirely dependent upon a plentiful supply of low-grade gas—low-grade from the point of view that it shall only have an illuminating value of 10 to 12 candles, that its heating value shall be as high as can be practically attained, and that its price shall be as low as is consistent with the interest of the consumers as well as of the shareholders in the gas industry. The only way open to us of obtaining such a gas is the dilution of a gas rich in hydrocarbons with water gas; methane being in coal gas the most important factor in giving calorific power. More than one-half of the calorific value of our coal gas is due to methane, and more than two-thirds to the mixed hydrocarbons; so that it is evident that these heat-yielding bodies must be fully represented in our gas supply.

As far as I can at present see, no method of carbonization will lend itself better to what is known as "auto-carburation" than the Settle-Padfield retort; and where any candle power from 18 to 10 is needed, I feel convinced that a combined Dellwik and Settle-Padfield plant will show the best results. But it must be clearly borne in mind that the water gas and the Settle gas must be generated independently, and that no attempt at generating the water gas in the lower portion of the retort is likely to give any good results. It must be passed at a fixed rate of flow through the retort during a portion only of the period of making the gas, so that no undue cooling may result. Used in this way, the water gas would be superheated in the hot coke at the bottom of the retort, would have any carbon dioxide it contained converted into carbon monoxide, and would reach the area of carbonization at a temperature exactly suited to the work it would have to do. Great interest centred in the erection of a bench of Settle-Padfield retorts at Exeter; but, unfortunately, in carrying out this work, it was found that water filtered through the soil at high tides, and got into the flues. This, with some of those minor faults in construction which have in every new process to be overcome, has caused delay; and it will be some months yet before a properly equipped plant will be at work.

In conclusion, I have only to express regret that the time at my disposal prevents me from going more deeply into this most interesting subject; but I think I have said enough to impress upon the gas managers of Ireland the fact that there is a wide field of advance open to them in the invention of new methods of carbonization, the main essential of which must be that the whole of the coal and the whole of the gas evolved from it shall receive, as nearly as possible, uniformity of treatment in the process of carbonization.

The PRESIDENT thought that, after they had listened to the lecture by Professor Lewes, they could not let the occasion pass without giving him a hearty vote of thanks. He had not had the pleasure of hearing Professor Lewes before; but he thought it was in 1900 that he lectured, and brought out the theory of washing the hydrocarbons quickly out of the coal-gas retorts by means of water gas. He read the lecture, and had been following up the matter since. He remembered very well the first thing that occurred to him was: "This is a theorist; he is not a practical man, because he suggests that a pipe should be put into the mouthpiece of the retort, and run back so far along the roof of the retort, but not to interfere with the drawing or charging." He said to himself: "What is to keep that pipe in position when

once the heat gets at it? It will shrivel up into nothing, and fall down into the charge." However, last year he had the pleasure of hearing a paper at the meeting of the Institution of Gas Engineers in London, by Mr. Stephenson, of Tipton, upon Professor Lewes's system. Mr. Stephenson was accustomed to double-ended retorts, and he put the water gas into one end, swept the gas through the retort, and obtained marvellous results—something like those which Professor Lewes had been telling them about. He did not know how the thing was to go on; but it seemed to him that if what Professor Lewes said he could take, and Mr. Stephenson seemed to get in practice, could be carried out, they would work a great revolution in gas manufacture. Instead of getting about 10,000 cubic feet of gas from a ton of coal, they might get up to 16,000 or 18,000 cubic feet. It would enhance the quality of their coke, and the value of it would be greater. He could only say, in conclusion, that he was highly pleased to have Professor Lewes bringing this subject before them; and he moved that they accord him their very heartiest thanks for his valuable lecture.

Mr. AIRTH said it did not require that the motion should be seconded, and he merely rose to support it. It had been certainly the most unequalled treat the Association had had since he joined it.

Professor LEWES, in reply, said he thanked them all very much for their hearty and kind vote of thanks. The President had mentioned once more a process which had been put before them in his name on other occasions, and on which Mr. Stephenson read an able paper at the meeting to which the President had referred. But his lecture that afternoon was not, in any way, intended to bring the process up again. He should hope that the process would be thoroughly tried, and its merits (or demerits) thoroughly brought out before very long; and until that was the case, it was useless discussing half-fledged processes. As Mr. Whimster had said, he was not a practical man; and he quite remembered, when he read the paper that had been referred to, he thought that the fixing of a pipe in the way described would answer the purpose very well. It might have its disadvantages; but it would have done one thing which never yet had been properly done in using the process—his idea was to pass hot water gas throughout the retort. Many had tried cold water gas, and they knew the damaging effect this must have upon the process of carbonization, by the cooling-down of the retort. His real object in his lecture that afternoon was not, as he had said, to talk about fledglings, but to bring to the notice of the members the road in which there was really an opening for most inventive practical work. They knew perfectly well that there, in Ireland, they had some of the brightest and best of workers. There was Mr. Tully. A process of his was in course of being made ready for trial, in one of their southern works; and he sincerely hoped Mr. Tully would have, as he believed he would, what he must call a deserved success with it. He really hoped that many of them would just turn over in their minds the matters he had been speaking of; and if some idea came to them, they would all profit by it. There was a large field before them. Let nothing stand in the way of their trying anything that was new. It was upon these lines that further big advances were to be made. He once more thanked them most heartily for his very pleasing visit to Armagh.

KEITH'S HIGH-PRESSURE LIGHTING.

Mr. G. Airth read a paper on "Keith's High-Pressure Lighting in Dundalk." This, with the report of the discussion, will be given next week.

CLOSING BUSINESS.

The PRESIDENT said they had now come to the end of the meeting, and he thought they might congratulate themselves upon having had a very successful gathering.

Mr. OUTON proposed a hearty vote of thanks to the President for the very able manner in which he had presided over the meeting.

Mr. J. NISBET (Portadown) seconded the proposition; and it was agreed to unanimously.

The proceedings then closed.

DINNER AND EXCURSION.

In the evening a party of more than sixty members and friends dined together in the Beresford Arms Hotel, on the invitation of the Armagh Gas Company. Mr. Best presided. After dinner, Mr. Whimster proposed that they accord a vote of thanks to the Company for their kindness to the Association that day; and the proposition was cordially received.

On the following day a most delightful excursion was made by a large company to Carlingford and Rostrevor. The party—a very happy one—separated at Warrenpoint Railway Station, with much manifestation of good-will.

Incandescent Gas Lighting for the Marine Drive at Scarborough.—The Marine Drive Sub-Committee of the Scarborough Corporation have decided to illuminate the new drive, when completed, by incandescent gas, at an estimated cost of £70 per annum, which will include interest on the capital outlay, maintenance, and the estimated cost of consumption. There will be 35 lamps, fixed about 40 yards apart.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Engineers and Contractors.

SIR,—I am sure I ought to feel much indebted to Mr. H. E. Jones for the delightfully Roseberyian phrase—"somewhat cryptic allusions"—in his letter of the 13th inst.

Roget's "Thesaurus of English Words and Phrases," however, unfortunately, classifies the word "cryptic" under the sub-heading "concealment." I must, therefore, respectfully take exception to what otherwise might have been accepted as a well-turned period.

Having carefully perused again the wording, together with the context, of the paragraph in my letter of the 29th of June, picked out by Mr. Jones, I cannot see how he construes it to contain a *concealed* meaning or imputation, either to the "making good of blunders" or to "cheques given corruptly." I stated plain facts—as known to me—in plain words, and now reiterate what was then penned.

If, in the face of this statement, a further translation of the wording is still desired, it is briefly as follows: In words used by Mr. Jones in his letter, the designers, in the instances referred to, did not "provide suitable or economical designs" to meet the local circumstances for the engineering work required to be done. Economy was sacrificed to effect, with the result that many "strokes of the pen on the cheque-book" have been required to pay the costs of the unnecessarily expensive types introduced; and what is probably of even more importance to the commercial well-being of the undertakings and the gas consumers dependent thereon, to pay the ever-running and excessive daily working charges. These costs are, in both cases, due (and I say this with deliberation) to the sections being ill-designed and badly laid-out in the drawing offices of the experts.

I hope I have now cleared away the perplexity which exists in the mind of Mr. Jones as to the meaning of the paragraph.

No brief is held by me for the case of contractors or contractor engineers; they are, no doubt, quite competent to defend their own position. But I do say that any gentleman occupying the position of President of the Institution of Gas Engineers—past, present, and to come—ought to weigh well his words before publicly, as the mouthpiece of the industry for the time being, condemning utterly, as the ex-President has done on more than one occasion recently, a, on the whole, very honourable body of co-workers with the engineers and managers of the various gas undertakings throughout the civilized world.

The case of "the incompetent engineer putting forward contractors' plans as his own" is surely far away from the point really at issue. This type—he may be common, but I do not think he is, as I have a higher opinion of the members of the industry generally—prostitutes the profession of which he is unfortunately a member. Such action on the part of a unit, however, does not warrant anyone throwing the onus of his (the incompetent engineer's) poor scheme of self-aggrandizement on to the shoulders of contractors or contractor engineers as a body.

Gas-Works, St. Mark Street, Hull,
Aug. 18, 1904.

J. HOLLIDAY.

A District Association for the North of Ireland.

SIR,—Since taking up the duties here about two years ago, my mind has been assailed several times with the sense of isolation and want of friendly communication with my fellow managers on points of mutual interest; and the thought has occurred to me more than once as to the desirability of having a small District Association for the North of Ireland gas managers, holding quarterly meetings (say) in Belfast.

The benefits to be derived from mutual intercourse and exchange of opinions are too well known to require from me any apology for the bringing of this matter forward. We have, in the Irish Association of Gas Managers, a splendid organization, as is seen by the enthusiasm which attended its meeting a few days ago in Armagh. But the meeting is only held once a year; and then papers of general interest are looked for. There are, however, many matters of importance to the manager of a small works upon which a profitable discussion might be held, but which, viewed in the light of an essay, would seem too trivial to be brought forward at the annual meeting. It is for the discussion of matters such as these that I would venture to broach the subject of a North of Ireland District Association of Gas Managers, and ask, through your columns, for an expression of opinion from my brethren in the North.

Omagh, Aug. 19, 1904.

JAMES BRODIE.

Electricity Supply and the Rates—"Forging Ahead."

A correspondent writes: "I enclose a cutting from the 'Peterborough Advertiser' of Aug. 20, the heading of which is delightful, and is not written sarcastic, as the paper is a strong partizan of electricity. Depreciation appears not to be considered." This is the paragraph—

FORGING AHEAD.—The net working balance on the electricity works last year was £1305 12s., against £167 in the previous year. After paying principal and interest on loans, there was a deficit of £1090—equal to about a twopenny rate.

Reductions in Price.—Last Wednesay, the Directors of the Bath Gas Company decided to reduce the price of gas 1d. per 1000 cubic feet, bringing the figure down to 2s. 1d. This is 2d. less than has ever been charged in Bath until the reduction to 2s. 2d. early in the present year. The Littlehampton Gas Company have decided to reduce their price 2d. per 1000 cubic feet from the 1st of October next.

REGISTER OF PATENTS.

Coin-Freed Mechanism for Gas-Meters.—Cowan, W., of Edinburgh. No. 15,321; July 10, 1903.

This invention relates to prepayment gas-meters having a price-varying mechanism of the pointer-and-scale type.

The invention deals mainly with the coin-receiving and price-changing devices, and more especially with those forms of mechanism in which the coin carrier or pocket and the prepayment screw always revolve in the same direction, and do not require the operating-handle and coin-pocket to be receded. Hitherto driving mechanism for operating the prepayment or measuring-out shafts has, says the patentee, been employed in which the driving pawl was adapted to be brought into engagement with, or withdrawn from, the driving ratchet wheel at a variable point—depending on the position of the pointer on the scale of the price-varying device. Now the patentee avoids the use of a driving pawl having a varying arc of engagement, and provides a new form of mechanism in which the disengagement of the driving mechanism and the prepayment shaft is effected directly by a pointer or projection actuated by a pointer—the angular position of the pointer being adjustable as required to meet the variations in the price of gas.

The prepayment shaft is operated directly through a clutch adapted to connect the prepayment and coin-pocket shafts, and the disengagement of the clutch is effected by means of a pointer, or a projection controlled by the pointer, the position of which may be varied so that the operating and prepayment shafts may be engaged for a variable portion of the revolution of the operating handle.

Fig. 1 is a front elevation of the scale disc employed. Fig. 2 is a sectional elevation looking towards the back of the disc. Fig. 3 is a plan of one form of coin-pocket and clutch device showing the clutch in engagement with the prepayment shaft. Fig. 4 is a plan showing the clutch just disengaged by means of the pointer cam or projection. Fig. 5 is a side elevation of fig. 1. Fig. 6 is a back view of the disc, showing the actuating cams or projections.

The coin-pocket A is firmly secured to the operating shaft B, and provided with any convenient means for preventing its rotation except when a coin is present. The coin is admitted to the pocket through

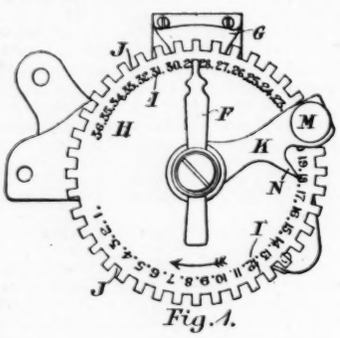


Fig. 1.

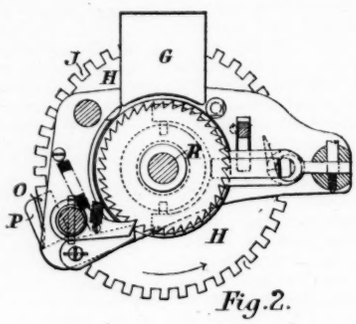


Fig. 2.

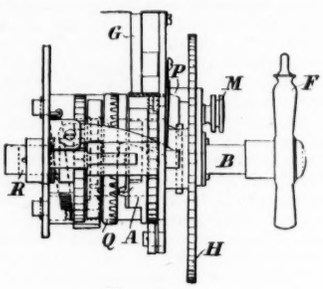


Fig. 5.

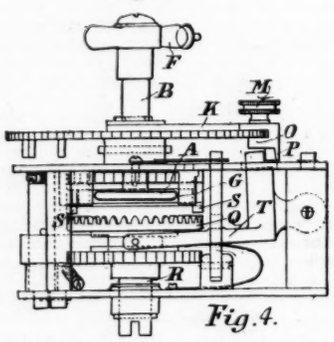


Fig. 4.

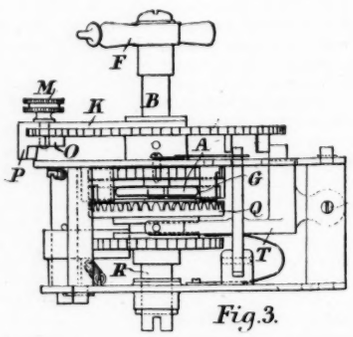


Fig. 3.

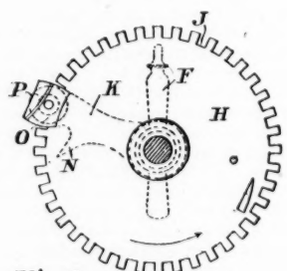


Fig. 6.

the guide G; an operating handle F being secured to the coin-pocket shaft whereby the pocket may be rotated when it contains a coin. On the coin-pocket shaft is secured a disc or circular plate H, provided with a scale I, and preferably a number of notches J, around its circumference.

Loosely mounted on the operating shaft B is an arm K, the end of which is bent over the circumference of the disc, and is provided with a screw pin M adapted to engage with any of the notches J and to clamp the arm to the disc. The arm K carries a pointer N, which may be moved with the arm to any desired position on the scale and secured there by the screw pin M. The bent-over part O of the arm K is provided with a cam or projection P. Over the inner end of the prepayment shaft R, adjacent to the coin-pocket, is loosely mounted a clutch-wheel Q, which is prevented from rotating upon the prepayment shaft R, but which may be moved along it so as to engage with one or more teeth or projections S (figs. 4 and 5) carried by the coin-pocket. The clutch-wheel Q may be operated by a fork lever T or the like, pivoted to a distance-piece between the side framing of the mechanism, or to any other suitable part. The clutch may be thrown into engagement with the coin-wheel by a spring of any suitable form, and it may be held out of engagement against the resistance of the spring by a pivoted finger or trigger, one end of which is prolonged and adapted to be lifted by a pin or projection carried by the disc. The clutch lever is provided with an extension, against which the cam P on the disc presses once during each revolution of the operating handle, in order to effect the disengagement of the clutch when the prepayment shaft has been rotated the desired amount.

The operation of the device is as follows: After placing the screw pin M of the pointer to the position for setting off the determined volume of gas to be supplied for the coin in the pocket, the handle F is rotated. As the disc H and pointer arm K revolve, the pin on the disc H comes in contact with the end of the retaining finger or trigger, and lifts it clear of the clutch-lever T. The clutch-wheel immediately slides along the prepayment shaft under the action of the spring; or a cam comes into operation with the end of the lever T, and positively puts the clutch into engagement with the teeth of the coin-pocket wheel. The prepayment shaft R is then rotated together with the coin-pocket shaft until the cam P, on the pointer arm K, comes in contact with the extension of the clutch-lever and positively moves the clutch-wheel Q out of engagement with the coin-pocket. The clutch-lever is then retained in its disengaged (or off) position by the finger, so that the operating handle, disc, and coin-pocket are disengaged from the prepayment mechanism during the remainder of the revolution.

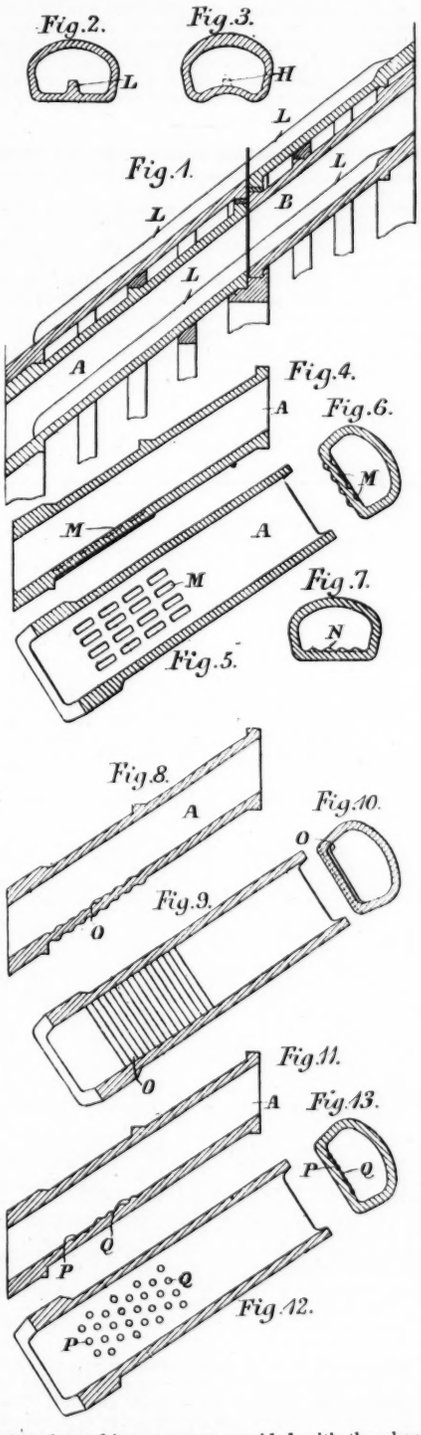
Formation of Inclined Gas-Retorts.—Derval, E., of Paris. No. 21,964; Oct. 12, 1903.

In order to obviate certain inconveniences found to exist in the working of many of the mixed forms of inclined retort-settings, the patentee proposes to form on the bottom of the retort towards the lower end, a series of channels, grooves, hollows, flutings, ribs, or projections of various shapes, in order to increase the friction of the coal on the botton of the retort, and prevent its accumulation against the stop placed at the lower end of the retort. The slipping of small coal is also to be prevented by ribs of tolerably large size extending the whole length of the retorts. These ribs "facilitate the disengagement of the gas and prevent the lifting of the coal during distillation." They also, it is said, increase the strength of the retorts, and facilitate the transmission of heat to the centre of the layer of coal. The same result may be attained by an arrangement which consists in arching internally the bottom of the retort, which increases the heating surface of the latter and allows the thickness of the crown of the retort to be increased without interfering with the passage of the flame. This latter arrangement, it is claimed, is specially applicable for retorts of great length; for "it prevents the decomposition of the hydrocarbons in contact with the hot walls of the retorts, and thus prevents obstruction of the ascension pipes."

Fig. 1 shows a longitudinal vertical section of an inclined retort with a smooth bottom, and composed of two parts A and B, inclined at the same angle and each furnished with a longitudinal rib L seen in transverse section in fig. 2. Fig. 3 shows a transverse section of a retort with arched bottom, which may also be furnished with a central rib H, shown in dotted lines. Fig. 4 is a vertical longitudinal section, fig. 5 a longitudinal section taken at right angles to fig. 4, and fig. 6 a transverse section of fig. 5, showing how longitudinal channels M may be arranged in the bottom of the lower part of the retort, which may be corrugated or not. Fig. 7 is a transverse section showing how the channels M of figs. 4, 5, and 6 may be replaced by ribs N. Figs 8 and 9 are longitudinal sections, and fig. 10 a transverse section, of fig. 9, showing transverse channels O in the bottom of the lower part of the retort; and figs. 11 and 12 are longitudinal sections, and fig. 13 a transverse section, of fig. 12 showing hollows P and projections Q formed in the bottom of the lower part of the retort.

The channels, grooves, and hollows are intended to prevent the liquid tar which is formed at the beginning of the distillation running down into the cast-iron mouthpiece. A large part of the tar remains, in fact, in the channels, grooves, or hollows, and adheres sufficiently to

the coke, when the distillation is finished, to be removed along with it when the retort is emptied. As regards the ribs and projections, they likewise, it is said, serve to divide the mass of the coal and to provide increased surface for the transmission of heat, without the necessity of reducing the thickness of the bottom of the retort. They may be employed alone or concurrently with the channels, grooves, and hollows. The large ribs L shown in figs. 1 and 2 may also obviously be employed alone or concurrently with the channels or projections mentioned. They prevent, as explained, the slipping of small coal to the bottom of the retort during the distillation.



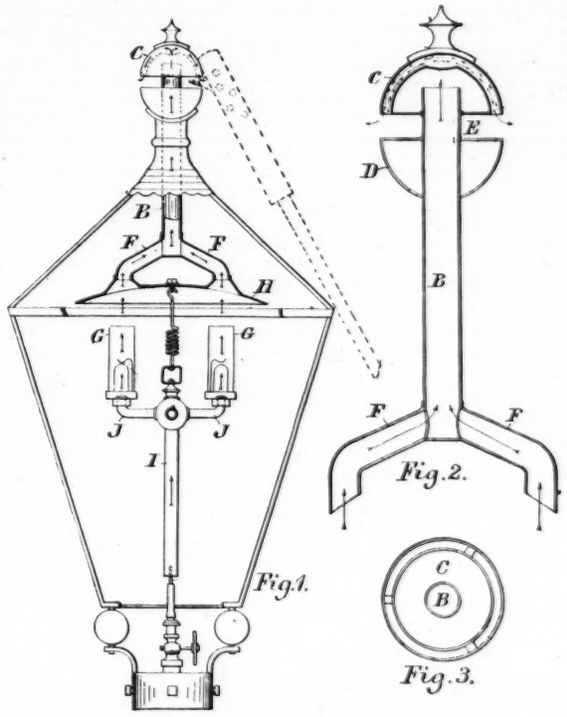
When coal is charged into a retort provided with the channels, or projections, and so forth, the thickness of the layer of coal will diminish towards the stop, "which will allow of a more complete distillation of the coal at the lower part of the retort." Further, "it will be possible when the large ribs L are employed to use any kind of coal and to increase the inclination of the inclined retort to facilitate the sliding down of the coke at the upper part—the lower part forming a kind of brake which prevents a too rapid descent of the coke."

The effectiveness of the means described for rendering the bottom of inclined retorts less slippery, and thus preventing the accumulation of coal against the stop, may be increased by employing curved retorts, or by reducing the inclination of the lower part of the retort, as described in patent No. 10,539 of 1902.

Street Gas-Lamps.—Hall, W., of Manchester. No. 22,512; Oct. 19, 1903.

The primary object of this invention is to provide a ventilator which, in whatever direction the wind is blowing, and no matter whether blowing mildly or strongly, will effectually prevent down-draught, and, if anything, tend to use the force of the wind to create an up-draught. A further object is to permit of the burners being lighted without requiring to open the door of the lamp.

Fig. 1 represents the lamp complete. Figs. 2 and 3 are a vertical section and plan of the ventilator.



The lamp body is of the usual construction; but upon the apex of the roof is arranged the ventilator, which comprises a shaft or pipe B and a hollow and double-walled dome-like cap or head C. The latter, which is fixed to the former, is, by preference, produced by means of two semi-spherical parts, one smaller and fitting within the other, and producing a space between them—small distance pieces holding them apart. The inner portion is closed by a plate, and through and to such plate passes, and is secured, the upper end of the pipe B, as shown. At a point immediately above the pipe end is an opening, equal approximately in diameter to the bore of the pipe. Surrounding, and connected to, the pipe or lamp top is another and inverted dome-like part D; and the two parts C and D collectively constitute a sphere cut in halves. Between the two halves is a space E. The lower end of the pipe B terminates in one, two, or more branches F, and the open ends of the branches come directly over the burner chimneys G. When a reflector, such as H, is used, the open ends of the branches may be connected to and carry it.

With the lamp in use, the air and products of combustion pass up the branches F and pipe B into the interior of the head part C, whence they escape into the atmosphere. Any wind blowing against the ventilator and passing up at one side of the part C, instead of blowing down into the lamp, passes away down the other side, as indicated by the arrows. In so doing, the wind promotes a decided up-draught in the tube B, and thus helps, instead of retarding, the escape of the products of combustion from the interior of the lamp.

The lamp burner fittings are made in the form of a pipe I with two or more radiating branches J, one for each burner; and the end of each branch is so formed as to serve (when fitted with a strainer and steatite ring) as the actual burner; no other fittings being necessary other than a gallery or ring to support the chimney. The pipe is suspended elastically and detachably by an ordinary anti-vibration spring and a swivel from an overhead support.

It will be seen that the whole fitting can be readily removed from the lamp when required, and be easily replaced; while (say) for renewing the mantles or other purposes, the fitting can be rotated until the burner which was furthest removed is the nearest, instead of having to reach round, as is usually necessary with ordinary fittings.

Incandescent Gas-Lamps.—Tattersall, H., of Leeds. No. 25,948; Nov. 27, 1903.

In incandescent gas-lamps capable of producing a powerful light, it has hitherto been customary (the patentee remarks) to feed the lamp with gas or air under pressure; but the cost of the forcing apparatus for the purpose is considerable, and consequently, in many cases, prohibitive. In order to overcome this objection, it has been proposed to dispense with the forcing apparatus and provide the lamp with a long chimney or flue, which latter has the effect, on the lamp being lit, of feeding the flame with a quantity of air, by the drawing or sucking action produced. The latter type of lamp, however (as hitherto con-

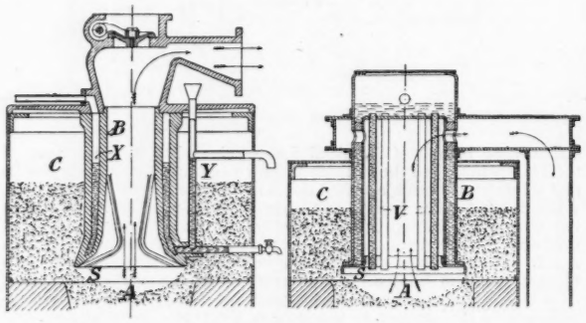
structed), is also of a somewhat expensive character; while the parts composing the lamp are so arranged that they are practically inaccessible, and thus the costs for renewals or repairs are a serious item. The object of his invention, therefore, is to produce an incandescent gas-lamp of a simple character, by which a powerful incandescent light may be obtained without the use of compressed air or gas; and, further, to so construct and arrange the lamp that the parts are accessible and may be readily and cheaply renewed at will.

He employs a suitable frame, preferably composed of ordinary gas-tubing forming a depending bracket, having its inlet pipe at the upper end and its outlet pipe projecting upwards from the base of the frame and central therewith. In between this frame is a long metallic chimney or flue, which may be fixed to, or be carried by, the frame; and the base of the flue is formed with a gland into which is passed a glass chimney, so as to have a sliding fit therein. The gland consists of a spiral spring located between two fixed rings, one of which is preferably attached within the chimney, and the other carried by a removal cap. The central gas supply at the base of the frame consists of an ordinary gas-jet provided with a fitting upon which is clamped a cylindrical casing formed with a cone-shaped base or mouth, which is located centrally over the gas-jet. In a suitable position over the casing is provided a second casing of similar formation, having a gauze covering on its upper end, in the centre of which is fixed a fork carrying a mantle of the ordinary type. The upper or superposed casing is provided with an external cone-shaped flange immediately beneath the glass chimney, and may also be provided with exterior prongs adapted to engage against the exterior of the glass chimney; while the burner may, if desired, be provided with a bye-pass.

Suction Gas-Producers.—Capitaine, E., of Frankfort-on-the-Main, Germany. No. 2547; Feb. 2, 1904.

This invention consists in an arrangement, in suction gas-producers, of the vaporizer above the combustion chamber inside, and concentrically with, the shell of the producer, and in the use of the space between the producer shell and the vaporizer as storage room for the fuel charge in such a manner that the hot gas generated in the combustion chamber of the producer flows through the vaporizer, where it gives off the greatest part of its heat to the vaporizer. Meanwhile, the fuel charge forms a natural and most effective insulation against heat radiation.

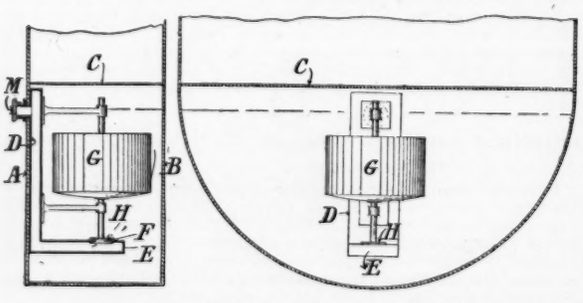
The illustration shows two forms of producer—the first is designed for smaller types of producers, and the second for the largest types.



A is the top of the combustion chamber and B the vaporizer. In the first arrangement, the latter is simply cast in one piece, forming a ring-shaped chamber X, into which water is supplied through the pipe Y. The steam flows off through the pipe shown, and is carried on through the burning coal in the usual manner. The chamber C contains the feed coal, which falls through the circular space S into the combustion chamber as required. In the second type, the cast piece B is replaced by a sheet-iron vaporizor of ordinary boiler-like construction, with pipes V for increasing the heating surface.

Wet Gas-Meters.—Hayes, J. & J., of Liverpool. No. 13,615; June 16, 1904.

This invention relates to wet meters having two chambers—an upper and a lower chamber. There is usually a water overflow pipe, or sealing spout, leading from near the bottom of the bottom chamber to the discharging nozzle; the latter being covered by a screw cap, except when the meter is being watered. The bottom of the sealing pipe dips beneath the water in the lower chamber, and thus forms a seal for the gas. In practice, however, it has been found that fraudulent



persons withdraw the water from the lower chamber (by syphoning it off through the discharging nozzle) and are then able to get gas without the meter registering. In other cases, it has been found that accidental injury to the lower chamber has allowed the water to escape and the water seal at the bottom of the sealing spout to be uncovered.

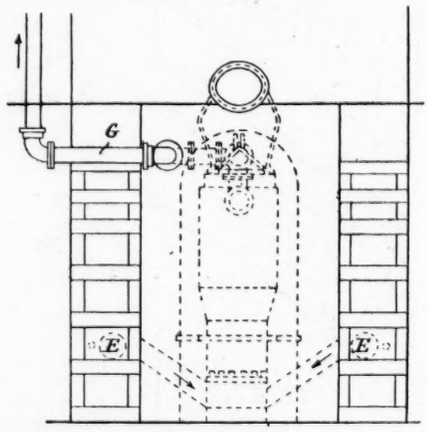
The present invention has for its object to remedy these disadvantages by forming a horizontal extension of the sealing spout furnished at the top with a valve seating, and providing a special valve and float.

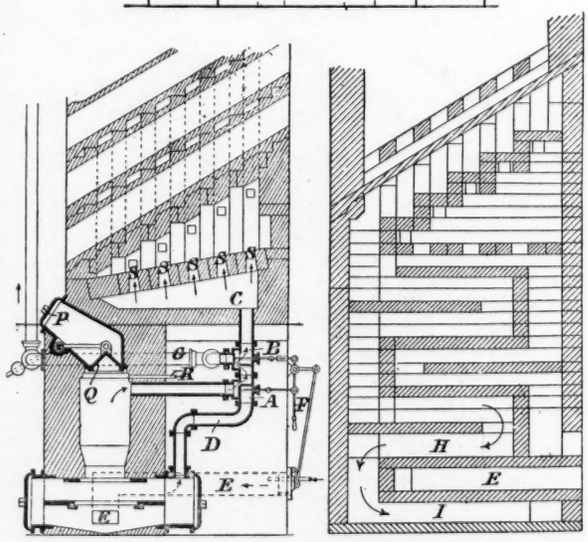
In the illustration, A is the front plate of the meter and B the back plate, while C is the plate that separates the two chambers. D is the upright portion of the sealing spout, and E the horizontal extension, on the top of which is a valve seating F, normally open, because when there is the proper amount of water in the lower chamber the float G keeps the valve H open—that is, away from the seating—and there is then a through way to the overflow nozzle M. If, however, from any cause, the level of water in the lower chamber drops below a certain limit, the float G drops, and the valve H closes down on to its seat F, and thus prevents the gas being withdrawn through the nozzle M from the lower chamber, even if there is no water at all in it.

Gas-Producing Plant for Heating Retort-Furnaces.—Poetter, H., of Dortmund, Germany. No. 8993; April 19, 1904.

This invention relates to plant in which a gas-producer is provided beneath the retorts, and which is employed for heating the retorts and also for producing water gas, which is led to the hydraulic main and mixed with the illuminating gas—thus increasing the gas production. The novelty of the invention consists in the arrangement of flues and valves by means of which producer gas may be supplied exclusively to the retort-furnace and partially to the gasholder.

The illustrations show the furnace from the front and in vertical section; also through the ports in the side wall.





When producer gas is to be made, the steam enters by the two lower air-ports E, which are heated both above and below by the outgoing heating gases, passing through the channels H and I. The three-way valve A in the outlet pipe of the gas-producer is so adjusted that the side branch pipe communicates with the upper branch pipe, while its communication with the lower branch pipe is shut off so that no gases can pass back through the pipe D. The valve B is open upwards, so that the producer gases can enter the flue S and pass to the furnace to be burnt. When the necessary water gas is to be produced, the lower air-port E and the valve A are wholly, and the valve B one-third, closed by means of the lever F. The steam now enters the generator from above, by means of the pipe R, and the water gas produced passes through the pipe D and the valves A and B. The valve B is so set that one-third of the water gas flows into the chamber E, and the other two-thirds into the pipe G and through it to the holder. The one-third of the water gas serves to heat the furnace during the production of the water gas. Any misadjustment of the valves is

"absolutely impossible," as all adjustments are made simultaneously by the lever F.

By means of the apparatus, which may be placed beneath any generator, it is said that the separate water-gas plants now required in gas-works can be dispensed with. In addition thereto, also, a saving of coke can be effected, and 25 to 30 per cent. of water gas can be added to the coal gas.

Incandescence Gas-Burners.—Spreadbury, R. J., of Tunbridge Wells. No. 2615; Feb 2, 1904.

This modification of patent No. 26,064 of 1897 relating to incandescent gas-burners whereby the total length of the burner is considerably reduced and the mixture of gas and air is heated as it traverses the upper part of the bunsen tube and before it reaches the place of ignition, "thereby increasing the temperature of the flame and the illuminating power of the burner," was fully described in the "JOURNAL" for July 19, p. 182.

Supports for Incandescent Mantles.—Skriwan, H., and Lenner, A., of Vienna. No. 13,004; June 8, 1904.

This invention has for its object to remove the disadvantages associated with the present supports for incandescent mantles by an arrangement by which the support can be adjusted relatively to a socket adapted to be placed on the burner so that the mantle requires no further adjustment during use, but at once assumes the accurate position with regard to the flame by simply placing the socket on the burner. The support referred to comprises a bow adjustable in a socket adapted to be placed on the burner, having a laterally or outwardly bent part at the point where the mantle is suspended, and straight legs or members connected to the socket by passing through, and being held in, sleeves, small tubes, or clips on the socket.

APPLICATIONS FOR LETTERS PATENT.

17,247.—KELLY, T. D., BILLINGTON, W. J., and WEIR, W. R., "Fuel for use in connection with gas, oil gas, and other fires, for lighting purposes, and for utilizing the waste products of combustion." Aug. 8.

17,276.—STEWART, D. M'G., "Automatic water seal for valves." Aug. 8.

17,304.—FIRTH, A., "Water heating and steam generating apparatus." Aug. 8.

17,309.—DYMOND, G. C., "Carburettors." Aug. 8.

17,314.—HOWORTH, F. W., "Cocks or taps for viscid liquids." Aug. 8.

17,353.—SUGG, W. T., "Anti-vibration burners for incandescent gas lighting." Aug. 9.

17,361.—BARTLETT, J., "Incandescent gas arc lamps." Aug. 9.

17,367.—IMRAY, O., "Incandescence lamps for liquid combustible vaporized by means of a heating flame." Aug. 9.

17,570.—WILLIAMS. M., "Gas-producers." Aug. 12.

17,580.—PATTERSON, W. J., "Treating coal for coking purposes." Aug. 12.

17,584.—KEITH, J. & G., "Incandescent gas-lamps." Aug. 12.

17,384.—MACKAY, E., "Indicators for gas and other engines." Aug. 10.

17,433.—WESTENHOLZ, T. F., "Automatically lighting and extinguishing gas-lamps." Aug. 10.

17,453.—WORRINGEN, E., "Apparatus for lighting gas and in connection with gas-burners." Aug. 11.

17,455.—TEE, H., "Incandescent gas lamps and burners." Aug. 11.

17,460.—HEYS, W., "Chimneys for incandescent gas-burners." Aug. 11.

17,464.—LIEBERMANN, L. S., "Inverted incandescent gas-burners." Aug. 11.

17,647.—LIZERT, J., "Pipe joints." Aug. 13.

17,661.—REDFERN, C. G., "Coking-ovens." Aug. 13.

PARLIAMENTARY INTELLIGENCE.

CLOSE OF THE SESSION.

On Monday last week the Royal Assent was given to the following Bills, and Parliament prorogued: Barnet District Gas and Water Bill, Belfast and North-East Ireland Electricity and Power Gas Bill, Derwent Valley Water Board Bill, Edinburgh and District Water Order Confirmation Bill, Felixstowe Gas Bill, Gas Orders Confirmation Bills (Nos. 1, 2, and 3), Gas and Water Orders Confirmation Bill, Hamilton Gas Order Confirmation Bill, Leeds Corporation (Water-Works) Railway Bill, Manchester Corporation (General Powers) Bill, Newcastle and Gateshead Water Bill, Oakengates, Dawley, and District Joint Water Board Bill, Rotherham Corporation Bill, Selby Urban District Council Bill, South Shields Gas Bill, Swindon Corporation Bill, and Water Orders Confirmation Bill. The Bill introduced by the President of the Local Government Board to amend the Alkali Works Acts was withdrawn.

The Leeds Consolidation Bill is the only Bill of the past session not finally accounted for. As already intimated, the Bill, which was multifold in its subject-matter, has had to be hung up until next March. The Lord Chancellor stated recently that it was one of the biggest measures with which he has had to deal for many a year; and as reports would have to be obtained from both the Home Office and the Local Government Board, the final stages in the Lords could not be passed through during last session. The Police and Sanitary Committee of the Commons were on the Bill for weeks, owing entirely to its bulk. But the Leeds Corporation must be thankful to know that they will not suffer through the delay in getting for their measure the Royal Assent during 1904.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of this Company was held last Thursday at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice calling the meeting; and it was afterwards agreed to take as read the Directors' report and the accounts. When affixing the seal to the Register of Proprietors, it was mentioned by the Chairman that they now number 2088.

The CHAIRMAN: I have now to move—"That the report and accounts be received, adopted, and entered on the minutes." I shall not have to occupy much of your time to-day, because the half year which has just been brought to a close has not been, so far as relates to the inner working of the Company, an eventful one; but I think the fact that we have earned our full statutory dividend, after paying interest on the debenture stock and temporary loans, and that we have left a surplus of £2286 to carry forward to the current six months, shows that the past half year has been a prosperous one.

THE CAPITAL ACCOUNT—A FURTHER ISSUE.

I desire to call your attention to a few points on the accounts, in order that you may have a clear understanding of the position and prospects of the Company. If you will turn to the capital account, you will notice that we received on account of capital issued during the half year £30,567; that we spent £29,187; and that the account is now overdrawn to the extent of £38,569. We have issued all the capital authorized by the Commercial Gas Act of 1875; and therefore we must now have recourse to the Commercial Gas Act of 1902. So far as I can see, there is no large outlay for works or plant in prospect. But the expenditure necessitated by the continued demand for coin meters and stoves will have to be met; and as we were borrowing £65,000 at the end of the half year, you will see it will be necessary shortly, when the market is favourable, to issue some further stock. In pursuance of the authority given to us some six or seven years ago, we have been issuing stock to the employees and consumers at a fixed price; and this policy has had very satisfactory results—for now a great many of both classes have become proprietors in the Company, and therefore are interested in its welfare above and beyond the community of interest which the sliding-scale gives to the consumer and the profit-sharing system to the employee. Our Act of 1902 empowers the Company to issue new stock to employees and consumers at a price not more than 5 per cent. below the market price; and, if the stock is not taken up by them, it must then be offered by public auction or tender. Now I am sure you will agree with me that it is advisable to do everything we can to bind up the interests of employees and consumers in the Company; and therefore we propose to offer the new stock first of all to the employees and consumers. But, in order to get them to become proprietors, we must offer the stock in such amounts as they can take up. As you know, our district does not contain very many rich people; and therefore we propose to offer the stock in small parcels from time to time. I shall presently have to submit a resolution to you authorizing the Directors to issue new stock as and when they think advisable.

STEAMSHIPS AND SAVING ON COAL.

Now I come to the question of capital expenditure. The first item in No. 3 account is for new steamships. When we met you in February last, I had the sad task of announcing the foundering of our first steamer (which we built to run up the River Lee to our Poplar works), off Whitby, in the month of January. You will be interested and pleased to know that the result of the Board of Trade inquiry—an inquiry held in the case of every British ship which is lost—was that the owners of the *Commercial* and the crew were entirely exonerated from all blame. Well, when the ship was lost, we were considering the advisability of building a third ship, precisely similar in all respects to the *Limehouse*, which was the second ship specially constructed for the Poplar works; and, when the *Commercial* was lost, the Directors decided that they could not do better than build two more ships like the *Limehouse*. Building two ships instead of one enabled us to get the work done at a cheaper rate. The first of the two new ships has been named the *Bow*, and it was launched about a month ago, and has already made three trips, with very satisfactory results. The second ship, which will be named the *Bromley*, after another parish in our district, we expect will be delivered at the end of this month; and I hope in two or three weeks' time she will be running as satisfactorily as the *Limehouse* and *Bow*. We shall then have four ships of our own: The *Poplar* of 1150 tons which runs to the Wapping works; and the *Bow*, the *Bromley*, and the *Limehouse* (each of a capacity of 700 tons), which are constructed to run up the river and under the bridges to the Poplar works. I should like to say that our policy in building these special steamers has been a very successful one. Indeed, it has already resulted in a considerable saving in the cost of carrying our coals from the North—in fact, the average cost of bringing the coal into the works all over the system has been reduced this half year by no less than 1s. 5d. a ton, as compared with the corresponding half of last year. The Board think this shows the success of their policy, and we expect the saving in the current half year will be even greater, because we have now four ships of our own, whereas for the greater part of last half year we were only working two ships of our own, and were hiring two others.

ORDINARY AND SLOT CONSUMERS.

The remaining expenditure on capital account was £25,852, all of which was practically incurred for supplying coin meters, and the services and stoves to go with them. Therefore, it is, of course, an additional source of revenue to the Company. We have now 55,571 consumers, of whom 24,854 take their gas through ordinary meters, and 30,717 through coin meters. This last half year we fixed 4827 coin meters and 3529 stoves. This is a record for the Company. I may

add that, in addition to the expenditure mentioned, we have carried out a number of improvements at the works—such as sinking wells to save the water bill, and altering a retort-house for stoking machinery—the expenditure for all of which has been charged to revenue, and will result, as we expect, in improved, and therefore cheaper, working.

THE REVENUE ACCOUNT.

Now, coming to the revenue account. Our profit is £60,434, as against £66,322 for the corresponding half of last year. The decrease in profit is due to two causes: First, that we have charged to revenue £5705 more on account of repairs and maintenance. Of this, I am sure you will approve. Secondly, our residuals show a considerable falling off, due to the drop in the price of tar and coke. The items on the expenditure side of the account—such as coal and oil—show a satisfactory decrease; and, on the other hand, the rental for meters, stoves, and prepayment meters show a satisfactory increase. When we made our coal contracts in March last, we got our coal at a small decrease in price on last year; but the full effect of this was not felt until the second half of the year began. The decreased price only applied to the coal consumed during the last three months of the past half year, and then we were using less than one-third of the total amount carbonized in the whole half year. In the present half year, therefore, there ought to be a considerably increased saving.

GROWING GAS CONSUMPTION.

The amount of gas sold in the half year increased by 50½ million cubic feet, all of which was due to the large number of coin meters in use in the district. Without the coin meters, we should have actually had a decrease in our sales. The increase mentioned was equivalent to 3·6 per cent.; while the Gaslight and Coke Company had an increase of just under 3½ per cent., and the South Metropolitan Company of 4 per cent. The quantity of gas made per ton of coal was 10,862 cubic feet, as compared with 10,436 cubic feet—an increase of 426 cubic feet, which, I think, is very satisfactory indeed. It speaks volumes for the work done by the men as well as for the skill of the Engineer.

THE DIVIDEND AND A REDUCTION IN PRICE.

Now, gentlemen, in the result, we have earned our full statutory dividend of £5 4s. per cent. on the 4 per cent. stock, and 5 per cent. on the 3½ per cent. stock; and we carry forward £24,116 of undivided profit to the current half year, as compared with £21,830 which we brought forward from the past half year. We thought the results were sufficiently satisfactory, under all the circumstances, to warrant our reducing the price of gas, in spite of the fact that the price of residuals is falling, and that in our district we are already beginning to feel the effects of depressed trade. We feel the effects of bad trade sooner than any other part of London; and we are the last to feel the benefit when a revival of trade takes place. Reducing the price of gas by 1d. per 1000 cubic feet, as from June 30 last, will bring us within 1d. of the lowest price ever charged in our district. It will entitle shareholders to receive an additional dividend of 2s. 8d. per cent. on the 4 per cent. stock and 3s. 4d. per cent. on the 3½ per cent. stock; bringing the authorized rate of dividend up to £5 6s. 8d. and £5 3s. 4d. respectively. This is equivalent to 13⅓ and 10⅓ per cent. on the unconverted stocks. Now, it is possible—I may say it is almost probable—we shall have to take something from our undivided profit to make both ends meet at the end of the current half year; but I hope that economies will enable us to earn the dividend we are recommending you to pay this half year. You will agree with this, that in our poor district, it is everything to sell gas as cheaply as possible; and we ought to do all we can, and we have done all we can, to help the poorer consumers to tide over times of depression and loss.

THE QUESTION OF DISCOUNTS.

Now this brings me to the question of discounts. I want to say this, that the experience of some years has fully shown that our policy in granting discounts is the correct one, because we have been able to keep, and even to secure, large accounts which otherwise we should not have had. I think there are only two grounds on which you can justify the giving of discounts. One is that the collection and management of large accounts are less expensive than in the case of small accounts; and the other is that getting large accounts enables you to cheapen the supply of gas to all the consumers. Therefore this helps the small man perhaps as much as—probably even more than—the large consumer. The Directors are convinced that we have been able to keep the supply of gas cheaper by reason of the granting of these discounts than otherwise we should have done; and therefore I think our policy is fully justified.

PROFIT-SHARING ALSO JUSTIFIED.

This leads me to the question of profit-sharing. Similar principles apply to this. You can only justify profit-sharing, and we can only continue the system, if, and so long as, it can be shown that the men, by increased effort and greater economy, contribute proportionately to the prosperity of the Company. I am happy to say the inquiries made from time to time do show that the conduct and the work of the men have been considerably improved since the system was inaugurated; and I have never heard from any officer of the Company any dissentient note upon that point. I think we may justly claim that our profit-sharing is not a bribe or a gift, or the outcome of mere sentiment or thoughtless philanthropy, but it is the just reward of honest work, it is a direct encouragement to the men to strenuous endeavour and economy, and it also encourages them to thrift.

THE BOARD OF TRADE COMMITTEE.

Now, gentlemen, I have only one other matter to which to call your attention. In February last, you will remember we announced that the Board of Trade had appointed a Departmental Committee to inquire and report upon the testing of gas in the Metropolis. The Committee met, and held some 21 sittings. They heard the evidence of representatives of the Corporation, the London County Council, the Gas Referees, and of the Gas Companies. Our own case was most ably put before them by Mr. H. E. Jones, to whom I am personally heartily indebted for relieving me of a task which would have necessitated a good deal of labour, because of the very technical questions involved. But I must say this, that the case of the three Metropolitan Companies was very much weakened by their failure to agree as to what was wanted in the interests of the Companies and the public; and I cannot help saying that the diversity of opinion shows itself in the report of the Committee, which I have to submit to you to-day. [The Chairman read the recommendations of the Committee, already given in our pages.] Proceeding, he said: Now you will see that the effect of the recommendation as to the testing for illuminating power would be that our 14-candle gas would be made to appear as if it were only of 13-candle power. However, in another part of the report the Committee say: "The issue would be of greater importance to the Companies if it were proposed to alter the actual quality of the gas they are required to supply. This is not the case. The matter is solely one of nomenclature." That is to say, they propose to require us to supply gas of an actual illuminating power of 14 candles, and to call it 13 candles; and if ever the day comes (as I think it will come) when we are authorized to supply gas of 12-candle power, it would only be called, if tested by this method, 8 candles; and when you get down to 10 candles, it would be called—well I do not know what it would be, perhaps 5, 4, or even 3 candles, because the test proposed robs the gas the more the lower the quality. I believe you will agree that this is very misleading; and I think it would probably have the effect of causing consumers to be dissatisfied, because they would not understand the matter, and they would naturally say they were being supplied with an article of a lower quality than that for which they were paying. It seems, moreover, foolish to call a thing by one name, with a mental reservation that it is something totally different. It is like the man who said that, when the hands of his kitchen clock pointed to half-past two, and the clock struck four, he knew that it was ten minutes past five. (Laughter.) Now I think that we should claim, and maintain our claim, that there should be no departure from the principle which was laid down so long ago as 1868, and has been continued ever since—that the burner for testing the illuminating power of gas should be such as is most suitable for obtaining from the gas the greatest amount of light, and is practicable for use by the consumer. That is just to the Company, and just to the consumer; and any departure from that would be both unjust and inequitable. I think there should be no going away from this point, and we should go on until we get justice. The other portions of the Committee's report are far more satisfactory; and it will be an important relief to the managers of gas companies when they are no longer required to remove the sulphur compounds, and when we get rid of the noxious process of lime purification. Certainly, too, it will be a very great relief when the very stringent test now in vogue for sulphuretted hydrogen is modified. Besides this, the hearing of applications for forfeitures for defaults before the Chief Gas Examiner, instead of before a Police Court Magistrate, is only a proper concession to the self-respect of those engaged in the manufacture of gas. I do not attach very much importance to the proposal that gas should be tested in a flat-flame burner, because I regard that burner as obsolete; and I think it is the business of the Company to teach their consumers the paramount advantage of the incandescent mantle. I look forward to the time, which cannot be very far distant, when there will not be a single flat-flame burner in use in our district. As to a calorific power test, this is not asked for on the part of those who buy our gas. Besides, there are no data at the present time on which an efficient test could be established. To fetter gas further with tests and penalties will only be a hindrance to the companies in cheapening the supply; and therefore it would be of no benefit whatever. Now you understand that these recommendations at the present time have no legal force. They are mere recommendations; and legislation is necessary to give them effect. What form that legislation will take, or by whom it will be promoted, has not yet been settled. It may be the Board of Trade will promote a Bill, or the London County Council. I myself think that the Gas Companies, who are the parties most interested, and who are directly most in touch with the gas consumers and public, are the right people to initiate legislation. There is a proposal that the Chairmen of the three Metropolitan Gas Companies should meet and discuss the question of promoting a Bill. I shall be glad to do my part; but the past history of gas in the Metropolis does not lead me to be very sanguine that it will be possible to come to an agreement. Therefore, it may be that, when we meet you next, you will be asked to give your authority to the promotion of a Bill on behalf of the Commercial Company alone. Nothing is decided; and therefore I cannot speak definitely on the point.

CONTINUED PROSPERITY ASSURED.

I think I have touched upon the salient matters in the accounts; and I have mentioned the subjects which affect the whole gas industry at the present time. I will close with this assurance, that our works are in first-rate order and condition; that our workpeople are thoroughly contented and satisfied; that we have no complaints at all from our consumers; and that I have every reason to hope that the prosperity which has always attended the operations of this Company will be continued in the future.

The Right Hon. Sir JOHN COLOMB, K.C.M.G., M.P., seconded the motion.

Mr. BADDELEY and Mr. HARSTON expressed their satisfaction with the report, and thanked the Chairman for his lucid explanation.

The CHAIRMAN, replying to a question by the last-named gentleman, said the Company had a plant for working up their own ammoniacal liquor; and it had been in use now some eight years.

The motion was unanimously carried.

Dividends were declared at the rate of £5 4s. per cent. per annum on the 4 per cent. stock and £5 per cent. per annum on the 3½ per cent. stock, less income-tax.

ADDITIONAL CAPITAL AUTHORIZED.

The CHAIRMAN next moved—"That the Directors be, and they are hereby, authorized, as and when they think fit, to raise, under the powers of the Commercial Gas Act, 1902, additional capital by the

creation and issue of 4 per cent. capital stock not exceeding in the whole the nominal sum of £150,000; and the Directors are also hereby authorized to raise and issue, at such times, in such amounts and manner, and on such terms as they may think fit, 3 per cent. debenture stock not exceeding in the whole one-third part of the amount which the Company have at the time of such creation and issue actually raised as additional capital under the authority of the said Act."

Sir JOHN COLOMB seconded the motion; and it was unanimously carried.

VOTES OF THANKS.

On the motion of Mr. SIMPSON ROSTRON, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having responded, moved a resolution acknowledging the services of the Engineer and Secretary and other officers, and spoke of the energy and ability that each one showed in promoting the prosperity of the Company. As to the workmen, they laboured very hard for the Company, early and late; and he believed the men were as satisfied with the service as the Directors were with the work that the men did for the Company. He therefore had the greatest pleasure in including them in the vote.

Mr. HARSTON seconded the motion; and it was cordially agreed to.

Mr. H. D. ELLIS replied for himself and for the branch of the staff with which he is particularly interested. Proceeding, he congratulated the proprietors on the recovery in the market value of their stock. Some six or eight months ago, the price was extremely depreciated. This was not owing to any inherent or intrinsic weakness in the gas industry, but simply to the extraordinary condition of things generally, and to the enormously reduced purchasing power of the public. When trustees and others had to realize gas and other stocks in the market, they were at the mercy of the jobber, who, not having a buyer to fall back upon to resell to at a profit, had to consider what was the lowest price he could offer and what was the highest price he could afford to give. The consequence was prices got very low indeed. A recovery had set in, and the price of the Company's stock had increased 10 or 12 per cent., and it was now approaching in the market something more nearly its actual value. At the last two meetings, it would be remembered, he referred to two important law cases which had been decided in inferior Courts. These decisions, he then took occasion to say, were, in his opinion, of great importance to companies like their own, and might be very prejudicial. Further, he ventured to express the hope that they would be carried to the Courts of Appeal, and be reversed. One of the cases was now in the House of Lords, but had not yet been reached. In the other case, the decision had been reversed by the Court of Appeal; so that they had certainly one gain. In his concluding remarks, he mentioned that this was his jubilee or fiftieth half-yearly meeting.

Mr. STANLEY H. JONES, responding for himself and the engineering staff, heartily acknowledged that the results of the half-year's working were mainly due to the good services of the foremen and workmen. One other interesting point in his remarks was that the Poplar Borough Council (who were one of the authorities who had accepted the Company's offer to fit up the street-lamps with incandescent burners) were, he recently heard, so pleased with the result that they were now proposing to supply with incandescent gas-burners some of the streets along which electric cables had been laid. At the present time, practically the whole of the Company's district was lighted by incandescent gas; and there were indications that it would remain.

LIVERPOOL UNITED GAS COMPANY.

High v. Low Candle Power Gas—Resignation of the Chairmanship by Sir Edward Lawrence.

The Annual General Meeting of this Company was held last Thursday—Sir EDWARD LAWRENCE (the Chairman) presiding.

The accounts presented showed that the total revenue for the year ended the 30th of June was £626,108 and the expenditure £494,468, which left a surplus of £131,640 to be transferred to the credit of the profit and loss account. After deducting the amount taken for payment of the dividend declared in February and the interest on the debenture stock, there remained a balance of £55,443. The Directors recommended a dividend for the half year of 5 per cent. on the ordinary consolidated stock, and 3½ per cent. on the 7 per cent. stock created under the Company's Acts of 1865, 1882, and 1886. They announced with regret the retirement of the Company's Engineer, Mr. William King, on the expiration of a long period of office (37 years); but said the shareholders would be gratified to know that the benefit of his great ability and experience of gas affairs, especially in relation to the Company's undertaking, would still be available, as he had accepted the position of their Consulting Engineer. In succession to Mr. King, they had appointed Mr. Edward Allen, who had been for many years in the service of the Company, during the last fourteen in the capacity of Assistant-Engineer.

The CHAIRMAN, in moving the adoption of the report and accounts, said all would admit that the report was very satisfactory—in fact, he did not know that they had ever had a more satisfactory one. As to the expenditure, they had paid a little more for coal because they had made more gas. Repairs and maintenance of the works had cost £9530 in excess of the previous year's amount, which arose from the fact that they had been obliged to incur considerable expenses during the current year for renewals. These were not yet completed, and an expenditure of a similar character would be continued during the next two or three years. From the sale of gas they had realized £17,798 more for what they had sold to general customers than in the previous year; and the public lighting had given them £1192 more; making in all £18,991 in excess of the sum they earned through the previous year. As to residuals, they received for coke, tar, and ammoniacal liquor £16,749 in excess of the preceding year. The total result of the working was that the expenditure amounted to £494,468, and that the balance carried to profit and loss was £131,640. From this, in order to estimate what the profit for the year really was, they must deduct £13,132 for debenture interest, which left a net profit for the twelve months of £118,508. They had £5118 in hand at the beginning of the year, which made an available amount of £123,626. From this had to be deducted £15,000, placed aside to meet the large expenditure which would have to be incurred during the next two or three years for improvements. When this was deducted, it left £108,626. The amount required for the year's dividend was £106,367; so that there would be a balance left in hand of £2259; and this the Directors had transferred to the reserve account, which was not yet up to its full statutory limit. In face of very flourishing accounts, they might perhaps be disposed to ask whether there was to be any reduction in the price of gas. He was sorry to say that, having regard to all the circumstances and facts, they could not see their way to make any reduction. The price of residuals, which had given such good results in the past twelve months, would show very different results for the coming year. They were not likely to receive from the residuals during the coming year within £15,000 of what they had obtained in the past year. They would have some saving in the price of coal and other matters, and they hoped that for the coming year the expenditure and the receipts would pretty well balance, and that they would be able to pay their dividends without in any way entrenching upon the reserve. While on the subject of the price of gas and its possible reduction, he might refer to an article in one of the daily papers in which the following question was asked: "Is this [20-candle power] essential to an adequate light, or is it to any appreciable extent waste? Perhaps some light will be shed on this subject by the Chairman of the Liverpool United Gaslight Company at the meeting next Thursday." This question was one for experts; and as he was not a gas expert, he would not attempt to dogmatize in the matter. On the relative merits of high and low candle power, the opinion of experts differed widely. He felt disposed to say, in the closing lines of the article in question: "The reduction of candle power may be worth consideration, if it can be demonstrated that consumers may thus be supplied at cheaper rates without any diminution of light." This had not been demonstrated so far; and he doubted if it could be. It seemed to him a simple matter of fact that if the candle power was decreased the illuminating power must be diminished. How far this might be compensated for by reduction in price was entirely another matter, which required very careful consideration. The subject had not been passed over by the Directors; and the former and present Engineers had made many test experiments. He would give the result with Bray's "Special" burner, which was in common use in Liverpool. The average loss of light on the reduction of candle power from 20 to 16 candles was 20·15 per cent. The reduction in price was 6·25 per cent.; so that the total loss to the consumer was 13·90 per cent. In face of these results, the Directors had not seen their way to ask Parliament to reduce the illuminating power of Liverpool gas; and he was convinced that if such a thing were done, there would soon be a great outcry among those who used gas for illuminating purposes, who formed the great majority of the consumers. This was the last time he should address the shareholders as Chairman of the Company. When he joined the Board in 1876, it was the custom to elect the members in rotation to fill the position of Chairman for a period of two years each. His turn for election came in 1881; but at the end of the usual period he was waited upon by Sir Thomas Earle, as representing his colleagues, and asked to consent to re-nomination. Since then he had been yearly re-elected. There came, however, a time to most men who lived to an advanced age when an inner consciousness warned them that, in the interest of all concerned, the reins that had been held by them should be transferred to younger hands. Hence he had intimated to his colleagues that he did not desire re-election to the post he had occupied for the last 23 years. During that period he had been keenly alive to both the duties and responsibilities of the office. As to how far he had succeeded in their efficient discharge, others must judge. But this much he might claim—that the administration of the Company had not deteriorated in any department during his tenure of office. He said this in no spirit of boasting, nor did he claim any immunity for the Company from errors to which all human instruments were at times liable; but he was confident that if the work could be submitted to an independent tribunal, the verdict would be that it had been well and faithfully done. From the first he realized the dual character of the Company, and that the rights of the shareholders and the gas consumers should be equally protected. It had been his aim to prevent the exceptional privileges of the former being strained to the disadvantage of the latter, and to secure the fullest freedom of trade in all their commercial dealings. He mentioned these things because the Company was very often unfairly and unjustly attacked. The principles that had guided its policy were very different from those so often imputed to it. Had it been otherwise, the Company would not have been in its present sound position. During the 23 years he had been Chairman—he took this period as being convenient—there had been, with the exception of one year, an uninterrupted increase in the manufacture of gas, which had risen from 2295 million cubic feet in 1881 to 4003 millions in 1904, or an increase of nearly 80 per cent.; while, owing to increased care and the adoption of up-to-date machinery, the make of gas per ton of coal carbonized had risen from 9830 to 11,282 cubic feet. The number of consumers had increased from 57,767 to 107,071. All this was in face of the competition of electric lighting, which had robbed them of many customers, both large and small. The quality of the gas had been maintained at a high standard; and the present price was the lowest in the history of the Company. With regard to the retirement of Mr. King, their Engineer, he was sure the shareholders would endorse the resolution of the Directors, which expressed their high appreciation of his long and faithful service. As to the future, he saw no signs of gas ceasing to be a valuable commercial product. Everything pointed in an opposite direction, and he felt with confidence that their property was as safe as any commercial undertaking could be.

Mr. J. E. TINNE, in seconding the motion, said they were extremely sorry to hear of the Chairman's decision to retire. It was, however, a considerable consolation to them to know that, while he ceased to be their Chairman, he would still remain a member of the Board, and guide them in the future with his mature and valuable experience.

Mr. G. H. BALL pointed out, in reference to the illuminating power of the gas, that the Chairman omitted to take cognizance of the widespread use of incandescent mantles. The consensus of opinion was that with incandescent mantles 16-candle power was ample for all purposes; and if the Act of Parliament were amended to enable the Company to supply gas of lower illuminating power—say 16 candles—they would be able to sell it at a much lower price than they were doing at present.

The CHAIRMAN replied that he did not mention incandescent burners because he referred simply to a burner that was most commonly used in Liverpool; but, so far as their experiments went, there was only a difference of about 3 per cent. in favour of the incandescent burner.

The report and accounts were adopted; and the dividend recommended by the Directors was declared.

Mr. WILLIAM KING was granted permission, at the close of the business, to make a few remarks. He referred to the fact that while he had held the office of Chief Engineer for 37 years, his connection with the Company extended to 48 years. He also alluded to the unique connection of his family with the Company—his father, his uncle, and himself having been continuously associated with gas lighting in Liverpool since the formation of a Company in 1816. Proceeding, he spoke of his endeavour constantly to keep in view the interests of the shareholders, and to the excellent relations which had always existed between himself and the staff and workpeople.

A vote of thanks was accorded to the Chairman for presiding; and the proceedings terminated.

CROYDON GAS COMPANY.

The Company's New Act—Continued Prosperity, and Recognition by Proprietors.

The Half-Yearly General Meeting of this Company was held last Friday, at the Croydon Art Gallery—Mr. CHARLES HUSSEY in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting; and then the Directors' report and the accounts were taken as read.

The CHAIRMAN said the past half year was one upon which the Directors felt that the proprietors might look back with gratification; showing as it did the continued steady growth of the undertaking both as to magnitude and prosperity. The most important event in the period was no doubt the passing of the Company's Act of this year; and on the result of the Company's appearance before Parliament, the Directors had unreserved reason to congratulate the proprietors. The Bill promoted had been passed as an unopposed measure, and without any modification of great importance to the Company. Now, although the Directors were satisfied that all the proposals of the Company were essentially fair, yet having regard to the many matters dealt with in the Bill, and to the large increase made therein in the Company's capital powers, it was hardly to have been expected, nor did the Directors venture to hope, that no opposition would be experienced. The Bill received close scrutiny from the various local authorities in the Company's area; and, as a result of negotiations, there had been inserted clauses meeting the wishes of the Corporation of Croydon as to the method of assessment of compensation for the closing of a private road, which, if left open, would have intersected the Company's enlarged works, and over which road the Corporation had a right-of-way. Bearing in mind what was pointed out in the report as to the ending of the period during which, in 1894, Parliament prescribed a difference in the price of gas between Croydon and the outlying parishes previously supplied by the Carshalton Gas Company, it was but natural that the local authorities on whom it devolved to look after the interests of the inhabitants of these parishes should seize the opportunity given them by the Company being before Parliament to press for a readjustment of prices in the two districts. These bodies approached the Company upon the matter; and, as a result of negotiations, the settlement mentioned in the report [see *ante*, p. 475] was effected, and embodied in the Bill. The Directors cordially appreciated the friendly attitude which had been displayed towards the Company by the local authorities concerned. They could not but feel, however, that this attitude was in some measure a tribute alike to the fairness of the Company's proposals, and to the reputation which they felt the Company might claim to have acquired of having displayed full regard for the interests of their consumers as well as for those of the proprietors. The following extract from a notice which appeared in the technical press at the time, the Directors could quote with some gratification: "The manner in which the Bill has been dealt with is one for general congratulation, as it evidences the confidence which subsists between the Local Authorities and the Company. The history of the latter shows that their attitude to the Authorities and the consumers has been a fair and even a generous one. Undoubtedly, the Company have had a favourable Act under which to work in the past; but they have never taken full advantage of their powers." To state briefly what was gained by the Act: It practically doubled the capital powers of the Company, which were being rapidly exhausted by the expenditure necessitated by its steady growth; and it enabled a large proportion of these powers to be so exercised as to permit capital being raised at the lowest possible rate. It gave manufacturing powers over a piece of land acquired by the Company immediately adjoining the present works, and also adjoining a railway line—powers which, when fully exercised, would enable the manufacturing capacity of the works to be doubled. It enabled the Company to close the road he had previously referred to, which road, if left open, would seriously hamper the use of the Company's land. And it further conferred upon the Company a number of miscellaneous powers which had from time to time been adopted in principle by Parliament since 1877, when the Company's last General Act was passed. With regard to the utilization of the additional land, the Engineer was engaged upon the preparation of plans for the considerable extension of the works rendered a pressing necessity by the growth of the undertaking. It would be seen from the report that the last 4 per cent. mortgage debenture bonds were redeemed in January. In their place was issued 5 per cent. perpetual debenture stock. The reason for taking this course was that, prior to the passing of this Act, the capital powers of the Company were those granted in 1877, when it was customary for powers to be given to raise a given nominal amount of capital; leaving gas companies free to secure such additional amounts by way of premium as their standing in the Money Market would admit. The result of this was that the higher the rate of interest or dividend that any loan or ordinary capital about to be issued could be made to carry, the farther the capital powers of the Company could be stretched. In the case of a company nearing the end of its tether in this respect, it naturally became important to issue capital bearing as high a rate of dividend or interest as possible on its nominal amount. The almost universal practice of Parliament now, however, was to allow the issue of so much stock as, with premiums obtained by the issue, should amount to a given sum. It would be seen that the new capital powers were granted in this way; and it might, therefore, be found desirable in future to exercise the borrowing powers of the Company by the issue of debenture stock bearing a rate of interest lower than 5 per cent. The proprietors might perhaps have noticed that the borrowing powers now possessed amounted to one-third of the ordinary capital powers—a much larger proportion than before the Act, when they were about one-seventh. As a consequence, the Company had obtained the power to raise by borrowing, in respect of the existing ordinary stocks, the sum of £72,500, and as this method of raising capital enabled them to get it at the cheapest rate, the Directors proposed to raise such money as might for the present be required by exercising the borrowing powers. From the report it would be seen that the quantity of gas sold, as compared with a year ago, had increased by 9·45 per cent. The number of consumers had in the period increased by 2033—namely from 20,195 to 22,228. This growth the Directors considered most satisfactory, especially in view of the strenuous efforts which were being made to push the electric lighting undertaking in the district. The proprietors would be asked to pass a resolution giving the Directors power to issue the £72,500 of loan capital to which he had referred, as and when they found it desirable. It was not, of course, intended to exercise the power to its full extent at once, although, during the next year or two, large sums of money would have to be spent on the projected additions to the works. Turning now to the accounts for the half year, it would be seen that a further £1000 had been written off in respect of the disused works at Carshalton, and that £1000 had been carried to a renewal fund. The formation of this fund had been authorized by this year's Act for the purpose of providing for the renewal and repair of the gas-works, mains, and pipes. It was clearly a sound business maxim that the funds necessary for the renewal or replacement of any portion of the plant should be accumulated out of the profits made during the time that the undertaking benefited from the use of the plant, rather than that the future should be left to provide for the wear and tear of the past. It would be observed that there had been a somewhat marked increase of expenditure under the head of repairing and renewing meters. This was caused by the fact that there had been charged in this half year the whole of the cost which would be involved in converting for use as prepayment or stop system meters the slot system meters that had hitherto been in use in the Carshalton district. There was an increase under the head of rents, due to the rent of new land acquired at Waddon, as well as under the head of rates and taxes, due to the settlement of the rating assessments alluded to at the last meeting. A new charge came into the accounts for the staff superannuation fund. To further assist members of the staff to make due provision for the future, the Directors had entered into an arrangement with a Life Assurance Office of good standing, whereby members of the staff could insure their lives and pay the premiums not in one annual sum in advance, but month by month as they received their salary, and could get, in addition, a substantial discount from the rate of the office to the ordinary public. Already there had been taken out under this arrangement a good number of policies, the greater part of which would probably not otherwise have been in existence. Turning to the receipts on revenue account, there was a general and satisfactory increase. The apparent drop in receipts under the head of public lighting required a word of explanation. Hitherto it had been the practice to include under this heading not only the receipts from public street lamps and from a few private lamps served direct from the mains and unmetered, but also the receipts for gas supplied to the local authorities, railway companies, and certain other very large consumers. The amounts now included under the head of public lighting comprised only unmetered contract supplies to the street-lamps. This was well considered by the Directors, who thought it the proper way of placing it; and after next half year the discrepancy would not appear. It would be seen from the report that the Directors had adopted the practice of supplying gas at a special price for purposes of motive power. There were several reasons for this. The sale of gas for motive power being to a large extent for use steadily throughout the day, winter and summer alike, and during hours of daylight, when otherwise a comparatively small quantity of gas would be passing through the distributive system, was more profitable to the Company than was gas consumed for lighting, which was naturally used at a much greater rate at one time than another. Thus gas for motive power naturally necessitated the provision of less plant for a given annual output. Then, too, users of gas for motive power consumed, generally speaking, a large quantity annually; and the general expense attendant on the working of every account was, in their case, distributed over a greater sale of gas. It must not be forgotten that users of gas for motive power had to look very closely at the cost of the fuel they burnt, and that gas-engines—cheap and convenient as they undoubtedly were as a means of furnishing power—had to enter into competition with other sources of motive energy. The Directors had taken one other step which they thought would soon be found to be of considerable value to the Company and to their consumers. They have arranged for a general reorganization of the outdoor staff, with a view to enabling it to cope with the great

increase of work consequent upon the Company's rapid growth during the last few years; and they had placed at its head a gentleman of considerable special experience, who would, they believed, render the Company excellent service. It was intended that the officers of the Company should endeavour to come more closely into personal touch with the requirements not only of consumers, but of possible consumers, than had heretofore been practicable, and that every opportunity should be at the disposal of residents in the district to obtain advice on the most economical way of using gas alike for purposes of lighting, cooking, heating, motive power, and special industrial applications.

The DEPUTY-CHAIRMAN (Mr. T. Rigby) seconded the motion.

Mr. B. GREEN inquired whether there was any possibility of the £20,000 of the Carshalton "C" stock being called up. Some of the shareholders thought it very desirable this amount should be wiped out of the balance-sheet.

The CHAIRMAN said that, considering the state of the market at the present time, the Directors did not think it advisable to issue this stock. Gas stock was not in the best form just now; and the Directors considered it better to borrow than to issue fresh stock.

Mr. T. WRIGHT congratulated the Directors upon getting their Bill through Parliament. With regard to the balance-sheet, he thought it was one of the best he had seen. On the engineering side, the make per ton of coal carbonized was good; and the unaccounted-for gas was well within bounds. On the financial side, the bad debts were only £67. The whole balance-sheet was an admirable one. He also bore witness to the efficiency of the outdoor staff.

The CHAIRMAN pointed out that he thought the favourable state in which the Company stood with regard to bad debts was due, in large measure, to the fact that they had a man specially appointed to look after arrears.

Mr. CORBET WOODALL proposed the declaration of dividends at the rate of 14½ per cent. per annum on the "A" ordinary stock; at the rate of 11½ per cent. on the "B" stock, and at the rate of 10 per cent. on the "C" stock, less income-tax. In doing so, he observed that this was the same resolution as was proposed this time last year with the exception that the "C" stock, which was the Carshalton stock, had on this occasion a ½ per cent. higher dividend; the price of gas in Carshalton having been reduced. He presumed that, inasmuch as, under the Bill which had just been passed, the price of gas would again be reduced in Carshalton, there would be a further increase in the dividend upon that stock very shortly. The pleasure that one had in moving this resolution as to dividends was increased by the knowledge that the dividend had not only been earned during the past half year, but that the condition of the Company was such that they might confidently count upon its being continued for a lengthened period to come. The Company had now faced the competition of electricity in Croydon for quite a considerable period; and he thought they might assume that the two systems had reached something like a normal condition in relation to each other; and to have, in face of that, an increase of nearly 10 per cent. in the consumption of gas in the past half year was a matter for distinct congratulation. He happened that day to have had the pleasure of going over the works. He had a fair opportunity of making comparisons between works in different places; and he thought their own were works of which any Engineer might be proud, and with which they (the proprietors) might be fully satisfied. He rarely saw works so complete and in such admirable order as those at Waddon. There was no attempt to introduce machinery for the sake of displacing manual labour; but much of the laborious, trying, and dirty work was now being done by machinery, to the great improvement and convenience of the work, and at the same time resulting in material economy in the working expenses. During the past half year, there had again been a slight decrease in the relation of capital to business. Although they were spending large sums of money, they were not spending money so fast as the business of the Company was increasing. He did not say this was going to continue without a break. They were engaged in spending a large sum of money, as the Chairman had told them; and it was therefore possible that, for a little while, there might be a movement in the other direction. But the general tendency would be, as he had suggested, a reduction in the relation of capital to business done. He should like to add a word with regard to the passing of the Company's Bill without active opposition. They were exceedingly pleased with this, not only because it meant a saving of expense, and at the same time the irritation which often accompanied fighting in the Committee rooms, but also as it was an evidence of the friendly relation in which the Company stood with the local authorities. He did not think it was possible to exaggerate the importance of maintaining harmonious relations with these bodies; and the Board strove their utmost to do it by treating them and the consumers with the consideration to which they felt they were entitled. The same might be said with regard to the rating appeal. The Directors thought at one time this would have to be fought; but by a little mutual concession, they had come to an agreement which they considered a fair one to the ratepayers, and of which the Company had no right to complain.

Mr. W. CASH seconded the motion, mentioning that the Company were not taking full advantage of their powers under the sliding-scale, but they had started a renewal fund with £1000, and were adding to their carry-over £2000.

The motion was unanimously agreed to.

Proposed by the CHAIRMAN, and seconded by Mr. A. W. OKE, the Directors were authorized, pursuant to section 13 of the Company's Act of this year, to borrow on mortgage, or by the issue of debenture stock, the sum of £72,500, inclusive of premiums.

Mr. PARKER moved that the remuneration of the Directors be increased by £350 per annum. It appeared that the fees per Director had not been increased since 1885. In that year, the sale of gas was 317 million cubic feet; it was now 923 millions—or an increase of 606 millions. In the same period, the gross annual revenue had risen from £78,725 to £178,618—an increase of £99,893. The price of gas, too, had been reduced from 3s. 3d. to 2s. 8d. per 1000 cubic feet; and the amount annually paid to the proprietors as dividend had increased from £20,458 to £35,521.

Mr. OKE seconded the motion, which was unanimously passed.

The CHAIRMAN expressed the Directors' appreciation, more especially as the addition had been prompted entirely by one of the proprietors. Proceeding, he proposed that the salary of the Secretary be increased by £100 per annum. He eulogized in the highest terms Mr. Topley's services to the Company, both as Secretary since Mr. Russell's retirement in 1902, and prior as Chief Assistant in the department from 1898. This gave an opportunity to the Chairman to also refer to the gratuitous and eminent services of Mr. Woodall in connection with the Company's Bill, and to Mr. Topley's strenuous labours in connection with both the Bill and the negotiations with the Local Authorities.

Mr. COLEMAN seconded the motion; and it was quite enthusiastically agreed to.

Mr. TOPLEY having responded,

The CHAIRMAN moved, and Mr. S. SPENCER seconded, a hearty vote of thanks to the Engineer and General Manager (Mr. J. W. Helps), the Secretary, staff, and workmen.

Mr. HELPS, in his response, took occasion to mention that the Directors had extended the workmen's breakfast time to three-quarters of an hour. This enabled them to get a comfortable breakfast, and was much appreciated by the men. As to the staff, he wished to say that in Mr. Caddick he had an assistant who could not be excelled anywhere.

Mr. TOPLEY also replied—referring to the excellent work done by his assistants; and then hearty acknowledgment was made of the services of the Chairman and Directors, on the motion of Mr. BAINES, seconded by Mr. WRIGHT.

This concluded the proceedings.

BOURNEMOUTH GAS AND WATER COMPANY.

The Ordinary General Meeting of this Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. W. Cash, F.C.A.) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read. The report stated that the results of the working for the half year were very satisfactory, showing an increase in every department over the corresponding period of 1903. It also mentioned that the Directors had placed £1000 to the reserve account, and recommended the distribution of dividends of 6, 7, and 14 per cent. on the preference, "B," and original shares respectively. This would amount to £14,084, and leave to be carried forward to the next half year a sum of £8779.

The CHAIRMAN said he had pleasure in moving the adoption of the report and accounts, upon which he thought that everybody connected with the Company could be fairly congratulated. The past six months had been good ones for gas companies in general throughout the country; and the Bournemouth Company had their share of that good fortune. In addition to this, they had had the benefit and advantage of the progress in business which it had also enjoyed for many years past. With regard to the accounts, he did not propose to go through the different items. The accounts were produced in the well-recognized form, and everybody acquainted with, and who took an interest in, the matter could pick out very readily the material points with reference to them. There were, however, one or two matters which came into the history of the half-year's affairs upon which he must inform the shareholders. By far the most important event had been the notice the Directors had received from the Corporation with regard to the softening of their water; and this took them back to the passing of the Company's Act of 1896, when they obtained powers for getting water from Wimborne. Of course, the Corporation were then very active in seeing that the greatest possible benefit they could secure should be given to the water consumers. Instead, however, of wasting a lot of money in the Committee rooms of the House of Commons and the House of Lords, the Board went down to Bournemouth in that eventful year, and spent a very happy day with the borough authorities. The latter asked for a large reduction in the price of water; and they were also somewhat anxious as to whether the water would not be unduly hard. The Board discussed the subject with them in a very friendly spirit. On the part of the Company, the Directors, of course, quite recognized the necessity of supplying the consumers with water (which was an absolute necessity) at the cheapest remunerative rate. On the other hand, the Board pointed out to the borough authorities that the Company were going to spend a large amount on sinking the well at Wimborne, and that they would consequently have to be careful with regard to the concessions they made. However, the authorities wished to ensure that the Company should spend an additional large sum of money in softening the water from Wimborne. Under these circumstances, the matter was discussed for a considerable time; and ultimately a proposal was made—he (the Chairman) believed he himself was responsible for it—that the Company should eventually meet the wishes of the borough with regard to reducing the price of water, not altogether, but at an interval; that the first reduction should be made on the passing of the Act, with a further reduction somewhat later on; that then, should it be deemed necessary hereafter that the water should be softened, the second reduction should either not take place or be remitted (in other words, that the Company should go back to the price of water subsisting after the first reduction); and that the decision as to whether the water should be softened or not should remain with the Corporation. This was the proposal which was accepted by the borough authorities, and was put into the Bill, and so became law. After having left the decision with the Corporation, the Board had not expressed an opinion in any shape or form as to the advisability or otherwise of softening the water. Speaking quite personally, he should have thought it would have been better to receive the beautiful water that Nature had been good enough to give them, and to have secured it at the cheapest possible price for the consumer, and to have left those who wanted it softened to themselves reduce it to any degree of softness they desired by methods which were at command. However,

the Corporation thought otherwise. He believed they were not unanimous—that there was a difference of opinion; but as in all these matters the majority must rule, the Corporation had decided to call upon the Company, under the powers of the Act, to soften the water. Of course, it now only remained for the Company to carry out their statutory obligations, and to do it as thoroughly and efficiently as they could. This they were setting to work to do. Their General Manager and Resident Engineer (Mr. H. W. Woodall) had been making inquiries; and he (the Chairman) had no doubt whatever that they would secure the best system of carrying the work out in accordance with the wishes of the people of Bournemouth. He should like to add, for the information of the shareholders, that the cost would be very heavy, and that the Company were not likely to be fully remunerated for the additional cost by the additional price they would have to revert to in the cost of the water to the consumers. The next point was that they were preparing, and were taking steps, to build their new gas-works at Poole. The Directors had approved a portion of the plans that morning; and they would now set to work, without delay, to carry them out. They were being designed by, and would be carried out under the guidance and supervision of, their Resident Engineer; and as he was about to win his spurs in this work—important work as it would be—they might be quite sure he would throw all his energy and enthusiasm into carrying it out. He should point out that, inasmuch as these new works would be a replacement of the old, the Board would endeavour to charge, and he hoped they would succeed in charging, the outlay to the revenue account, and getting it cleared off—at all events that portion of it which was so chargeable—as early as their good fortune would enable them. The shareholders would also note that they were now to receive the increased dividend that for some years the Directors had been promising. They believed that the Company had got into such a financial state that they might increase the amount of the dividend on the ordinary shares. He should remind the shareholders that, even with this increase, they were within their powers under the sliding-scale, and that they had been entitled to an increase for more than five years which had not been taken. He thought they were justified in pointing out to their friends at Bournemouth that they had been moderate and modest in their action with regard to this matter. One other point. The Board issued a short time ago some 4 per cent. debenture stock at the price of £110; and in accordance with their promise, they gave the first opportunity to the shareholders and to the consumers to take up the stock. They had issued the greater portion of the stock; but there was still a little left, if there were any shareholders or consumers who wanted some. He did not think there was anything more to add. They had still to face the competition of electricity. The competition was fierce; but he hoped it was friendly. With a certain amount of experience in this particular matter, and looking at it from time to time as a layman, he was more than ever convinced that there was plenty of room for gas whatever developments might come out of electricity, and that the shareholders might rest assured that there was not only a present but a future for the important work upon which they were engaged.

Mr. Corbet Woodall, in seconding the motion, said the Chairman had mentioned the two most interesting items that were occupying the attention of the Company at the present moment. The extension of the Poole works was one that was called for by the great increase in the demand for gas both in Bournemouth and in Poole. It had been explained to the shareholders already that it was not desirable to extend the Bournemouth Gas-Works to any very great extent. They were rapidly becoming—he would not say the centre, but on the fringe of an important residential district; and though the Directors thought that the presence of a gas-works in that situation was not likely to injure the value of the property, some people took a different view. At Poole, the Board had been able to secure excellent land for the purpose. They had the entire sympathy of the Corporation of Poole in the works they were proposing to construct; and therefore the extension required for the whole undertaking was more suitably made there, and especially inasmuch as the Company would be able to get their coal direct to the works, instead of trans-shipping it, and carrying it by rail, as they had to do at Bournemouth. Since the acquisition of the Poole gas undertaking less than two years ago, the business in the district had increased by something like 150 per cent., which was almost a unique development—due, he believed, almost entirely to greater energy and to the reduction in the price of gas. With regard to the softening of the water for the Bournemouth supply, he was disposed to agree with the Chairman that it would probably have been as well for the consumers in Bournemouth if this extensive work had not been required on their behalf by the Corporation. At the same time, they must bear in mind that the water supply of Bournemouth was of the first importance to the town; and in such a matter they must agree that the Corporation were more likely to look upon the matter with an unbiassed and impartial eye than the Water Company. They would, as the Chairman had said, carry out the work as efficiently as was possible; and in this, and in every other way, the Company felt their interest, as well as their duty, required that they should do the utmost possible to continue the water supply in a condition such as it had been in the past—beyond reproach. He would add, with regard to the increased dividend, that though the increase was 1 per cent. upon the ordinary shares yet because of the small amount of these shares the increase would for the half year cost only £250, which would not alarm the consumers of gas and water in the district. The rate paid would still be below the amount to which, under the sliding-scale, they were entitled.

The motion was unanimously carried.

On the motion of the Chairman, seconded by Mr. R. Hesketh Jones, the dividends mentioned were declared, less income-tax.

Mr. W. E. Holding moved a hearty vote of thanks to the Chairman and Directors for their services. He thought the shareholders might congratulate themselves that the Directors were able to pay an additional 1 per cent. on the ordinary shares. This alone showed that the Company was a prosperous one.

Mr. J. C. Benwell seconded the motion; and it was agreed to.

The Chairman, in replying, said his colleagues and himself were much obliged for the kind expression of the shareholders' appreciation. The gentlemen present were representative of the 900 odd shareholders who had expressed their confidence equally by staying away. He should like to move a very hearty vote of thanks to the officers and the whole of the staff. Results such as had been produced in the half year could not possibly have been obtained if the Company had not had a most efficient staff—from Mr. Cash and Mr. Harold Woodall at the head down to the humblest workman. They were giving their Engineer a lot to do in the new works. This would afford him an opportunity of showing what was in him; and he (the Chairman) had the greatest possible confidence in the result.

Mr. S. L. Rymer, J.P., seconded the motion, which was unanimously carried.

Suitable acknowledgment was made by both Mr. Woodall and Mr. Cash—the former heartily endorsing what the Chairman had said, that there was hardly a man from the top to the bottom who had not done his work well.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

The report to be presented at the annual general meeting of this Company on Thursday next shows that the business continues to grow. The quantity of gas sold in the six months ending June 30 was 66,860,000 cubic feet, or 17·37 per cent., more than in the corresponding period of 1903; and the consumers paid for it at the rate of 2s. 10d. per 1000 cubic feet, less discounts. Altogether 451,661,000 cubic feet were sold, which produced a revenue of £63,843; the rental of meters, stoves, and fittings, and the maintenance of incandescent mantles, brought in £6827; residuals yielded £10,825; and the total receipts were £81,524. The expenditure on the manufacture of gas was £45,757; on distribution, £13,390; and on management, £3062—the total expenses being £68,142. The balance carried to the profit and loss account is £13,382; and the amount available for distribution is £23,480. The Directors recommend dividends at the rates of 6¼ per cent. on the "A" stock, and 4¾ per cent. on the "B" stock, less income-tax. The payment of these will absorb £10,730, and leave £12,750 to be carried forward. The accounts relating to the working show that 21,664 tons of coal were carbonized in the half year, and that 953,714 tons of oil were used for enrichment. The total make of gas was 491,167,000 cubic feet, of which 459,490,000 cubic feet are accounted for. The estimated quantities of residuals made in the six months were: Coke, 12,998 tons, of which 5414 tons were used in the production of carburetted water gas; breeze, 4642½ chaldrons; tar, 360,980 gallons; and ammoniacal liquor, 6017 butts. The make of sulphate of ammonia was 171 tons 11 cwt. 3 qrs. 16 lbs. The meeting on this occasion is to be held at the works, in deference to the wishes expressed by several of the proprietors. Opportunity will thus be afforded them, at the close of the proceedings, of inspecting the establishment which Mr. A. E. Broadberry, the Engineer and Manager, conducts so efficiently, as is shown by the results above referred to.

WANDSWORTH AND PUTNEY GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday at the works—Mr. H. E. Jones (the Chairman) presiding.

The accounts presented showed a revenue of £73,030 and an expenditure of £60,330 in the six months ending the 30th of June; leaving a balance of £12,700 to go to the profit and loss account. The amount available for distribution was £15,923; and the Directors recommended dividends at the statutory rates of 7¾, 6¼, and 5 17/20 per cent. per annum on the three stocks of the Company.

The Chairman, in moving the adoption of the report, said he thought those present would accept the accounts as read. He then proceeded to say that coals had cost a little less, and oil rather more; and though the price of gas had been reduced by 2d. per 1000 cubic feet, they had earned sufficient money to enable them to pay the necessary dividend. The profit was £679 less than it was for the corresponding period of the previous year; but this was due to the lower price of gas. There had been an increase in the sale of gas of nearly 6 per cent.; the large London Companies only having increases of between 3 and 4 per cent. The money received for gas was £561 less than in the corresponding period of 1903; but, on the other hand, the rental for stoves and meters had increased by £800—therefore more than making up for this loss. All the charges for manufacture were about the same. Notwithstanding that the price of gas had been reduced by 2d. per 1000 cubic feet, it was very satisfactory to find that there had been this increase of nearly 6 per cent.; and when one came to consider that the shareholders only obtained £400, from the decreased price of gas, and the consumers £3600, or nine times as much, he thought it went to prove how great was the benefit of the sliding-scale, which was a policy the Company had always advocated. He thought there was nothing else calling for much comment; but there was just one very important thing he would like to mention. About a year-and-a-half ago, a Departmental Committee of the Board of Trade, composed of very scientific gentlemen, was appointed to inquire, among other things, into the question of sulphur in gas. The Company had recently expended upwards of £4000 on the erection of additional purifying apparatus to eliminate the sulphur from the gas, as required by Act of Parliament. The Committee reported that they were of opinion that the sulphur clauses were too stringent, and advocated their moderation, and he hoped the local Council would go into the matter, and thus allow the consumers the benefit of the great amount of money requiring to be spent in the department of purification, for which so little was obtained. He doubted whether any of the consumers had noticed any difference in the gas since it had been tested for sulphur.

Mr. T. A. Howell seconded the motion, and it was carried unanimously.

The rates of dividend recommended—viz., £7 15s., £6 5s., and £5 8s. 6d. per cent. per annum on the "A" and "B" consolidated stock and the "C" ordinary stock respectively—were then declared. In each case, the amount included the extra dividend allowed by the sliding-scale—viz., 5s. per cent. on the "A" and "B" stocks, and 3s. 6d. per cent. on the "C" stock, per annum.

Mr. DENNY said that, after hearing such excellent news, he had very great pleasure in moving a vote of thanks to the Directors and staff of the Company, which he thought all would agree was distinctly well and ably managed. He said they were all very pleased to live in a neighbourhood where gas was very nearly the cheapest in London, especially considering that the electricity was very dear. He thought gas had made considerable headway recently, seeing that it had been selected to light Aldwych—the very important new thoroughfare from the Strand to Holborn. He added that he had no idea the local Council had anything to do with the question of sulphur, but thought the Government were responsible for it.

The CHAIRMAN explained that the Council were the body who appointed the official Gas Examiner.

Mr. DENNY said a very satisfactory feature of the accounts was the small amount of capital which had been expended; and he thought the Company came in with the best of them.

Mr. OKE, in seconding the motion, said he quite agreed that everything was extremely satisfactory. He considered the consumers were getting a very substantial reduction in the price of gas; and he felt confident that when they met again, they would find that the policy of reducing the price as often as possible was undoubtedly the right one.

The resolution having been agreed to,

The CHAIRMAN, in returning thanks, said it was a significant fact that where the electric light was in the hands of the municipality, they were compelled to have many of the streets lighted by incandescent gas, as the cost of electricity under their mode of supply was too high for the ratepayers. The Company would soon be issuing some more stock by auction or by tender, and probably it would be offered to the shareholders, and also to the consumers and employees of the Company.

A vote of thanks to the Secretary (Mr. C. W. Braine), the Engineer (Mr. H. O. Carr), and the staff closed the proceedings.

BARNET DISTRICT GAS AND WATER COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held at the Albion Tavern, Aldersgate Street, E.C., last Friday—Mr. CHARLES HORSLEY, J.P., in the chair.

The SECRETARY (Mr. E. W. Drew) read the notice convening the meeting, and the seal of the Company having been affixed to the Register of Proprietors, the report of the Directors, with the accounts for the six months ending June 30, was taken as read.

The CHAIRMAN said he thought the balance-sheet, which was a very good one, would speak for itself. The Engineer (Mr. T. H. Martin) reported that the works generally were in good repair and condition; and there had been a satisfactory increase in both the gas and water departments. The balance standing to the credit of the profit and loss account amounted to £27,396 17s. 7d., out of which the Directors recommended the declaration of a dividend, less income-tax, for the half year at the rate of £7 10s. per cent. per annum on the "A" and "C" stocks, £6 10s. per cent. per annum on the "B" stock, and £5 5s. per cent. per annum on the "D" capital gas and water stocks. The Directors regretted that their endeavours to secure parliamentary authority for a new source of water supply outside their district had not been successful; but the Bill, notwithstanding the elimination of the clauses relating thereto, conferred substantial advantages on the Company, and received the Royal Assent on the 15th inst., so was now an Act of Parliament. The coal carbonized during the half year amounted to 4908 tons, against 4480 tons in the corresponding period of 1903; being an increase of 428 tons. The average price of coal was 17s. 4d. against 18s., or a decrease of 8d. per ton. The quantity of gas made was 53,528,000 cubic feet, against 49,208,000 cubic feet, or an increase of 4,320,000 cubic feet. The gas made per ton of coal was 10,906 cubic feet; and the gas sold, 49,941,000 cubic feet, or 10,175 cubic feet per ton, against 9979 cubic feet; and the gas unaccounted for 5·20 per cent., against 7·65 per cent. The coke made was 4674 chaldrons compared with 4267 chaldrons; and the coke sold 3665 chaldrons, against 3315 chaldrons. The average price of coke sold was 10s. 4d. against 10s. 7d. per chaldron. Of tar, 57,499 gallons had been made, against 56,000 gallons; and the make per ton was 11¾ gallons—the average price of tar sold being 1⅝d. per gallon. The sulphate made was 53½ tons; and 21¾ cwt. was made per 100 tons of coal. The average price of the sulphate sold was £7 13s. per ton. The receipts from gas were £9630, against £8922; and from residuals £3121, against £2602. The expenditure on coal was £4270, against £4042; and the working expenses amounted to £4382, compared with £4485. The profit on gas was £4099, against £2997; being an increase of £1102. In the Water Department the receipts were £14,645, compared with £14,249; and the expenditure was £5243, against £5852—the profit being £9402, against £8397. Turning to the profit and loss account, the total profits on gas, water, and fittings, &c., were £13,581, against £11,480, less interest on loans and income-tax of £1790; showing a net profit of £11,791, against £9379, or an increase of £2412. The amount required to pay a dividend at the rate of 7½ per cent. was £8920; leaving a surplus of £2871 to be added to the balance carried forward, compared with £1139 in the corresponding half year. Though they might have paid a little more by way of dividend, the Directors thought it better to carry the amount forward, so as to avoid the necessity of raising further money by loan. In conclusion, he moved the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. A. H. Baynes) seconded the motion.

Mr. KAIN asked whether the Company catered for the poorer classes by means of slot meters, and whether the extraordinary parliamentary expenses were likely to occur again.

The CHAIRMAN said they had between 800 and 900 slot meters in use at present. He did not think the parliamentary expenses would appear again for some time. The Company had not been able to obtain power to get water outside their area; but there was a clause in the Bill which enabled them to get further supplies within the district.

Mr. DYER, in congratulating the Directors on the favourable balance-sheet, expressed regret that they had been put to unnecessary expense by Parliament. He could not understand why the Lords Committee had struck out of the Bill the clause about getting water from outside the district. It looked very much as if they said that, though the Water Board might take water from one source, the Company could not do so. The Hertfordshire Council had opposed the Bill on the ground that the Company were taking water out of the county; but really and truly they were supplying a large portion of it.

The CHAIRMAN: A large portion of our district is in Hertfordshire.

Mr. DYER said the Marquis of Salisbury had opposed the Bill on the ground that the Company would interfere with the fish at Hatfield; and he could not help thinking that the Lords thought more of the general welfare of the fish in the vicinity of Hatfield than the welfare of the people of Barnet. As the Company were bound to supply the statutory district, surely Parliament ought to give them power to obtain the necessary water.

Mr. RAINSFORD said he should like to know how far the Company had been injured by the fact of their having lost the power to obtain water from outside, and what were the benefits the Company had already received by having lost it.

The CHAIRMAN said he thought he ought not to be called upon to answer this question. All he could say was that the Company had benefited, as they had secured power to get water in different parts of the district.

Mr. RAINSFORD thought it would be to the interest of the shareholders to know what these benefits were.

The CHAIRMAN said they had power to go east, west, north, and south in their own district, but they could not go outside. He felt certain they would find water within their district.

Mr. A. DICKSON thought the policy of the Board in endeavouring to obtain possession of a site contiguous to their own outside the district had been shown to be a proper one, because had it been obtained it could have been worked economically. The reason the Company did not obtain the authority applied for was because the water-bearing power of the district was already pledged to other water authorities; and it was thought undesirable to introduce another water company to take water which had already under parliamentary authority been appropriated to other districts. The position which the Company now occupied under their new Act was one with which the proprietors should not be dissatisfied. They might not be altogether sure of the potentialities of the different parts of the district; but there was little question their own area would furnish a sufficient supply of water.

The motion for the adoption of the report was then put and carried unanimously, as was also a resolution for the payment of the dividend recommended.

The CHAIRMAN said he hoped, with Mr. Dickson, that they would find water within their district. The Directors knew pretty well where it was to be obtained; still, if they had got their Bill, they would have gone somewhere else. He proposed a vote of thanks to the Engineer, Secretary, and staff of the Company for the valuable assistance they had rendered.

Mr. DICKSON seconded the motion, and it was carried unanimously.

Mr. MARTIN said it had been his pleasure to reply to this vote for the last 31 years, and he assured the shareholders that he would continue in the future to devote his best attention to their interests.

Mr. DREW said the vote was highly appreciated by himself and all the other officers of the Company.

Mr. OKE, in proposing a vote of thanks to the Chairman and Directors, said a great deal of hard work had devolved on the Board. Considering how keenly the Bill was opposed, he thought the shareholders ought to be very thankful to the Directors for the able way in which the affairs of the Company were managed.

Mr. DYER seconded the motion, which was put and carried unanimously.

The CHAIRMAN briefly acknowledged the vote, and the proceedings terminated.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Increased Revenue at Aldershot.

The accounts presented at the recent half-yearly meeting of the Aldershot Gas and Water Company showed a total revenue from the two branches of the Company's business in the six months ending June 30, of £24,517, compared with £23,268; while the expenditure was £18,251, against £17,119. The amount carried to the profit and loss account was £6266, compared with £6149. After providing dividends on preference shares, and interest on the preference stock, mortgage, and debentures, the Directors recommended a dividend at the rate of 11½ per cent. per annum on the "A" shares; 8½ per cent. per annum on the "B" shares; and 7 per cent. per annum on the "E," "F," and "G" ordinary shares, all less income-tax. Owing to the abnormal rainfall of the past year, less water was required by the War Department, and none by outside companies, during the half year under review. Both items affected the water revenue, as compared with the corresponding period of 1903. The reduction of 2d. per 1000 cubic feet in the price of gas (benefiting the ordinary consumers to the extent of at least £800 per annum and the shareholders by £90 per annum) reduced the gas revenue; but the accounts showed an increase, owing to larger sales of gas. The Chairman (Mr. A. F. Wilson), in moving the adoption of the report, stated that at the beginning of this year the Directors announced a reduction of 2d. per 1000 cubic feet in the price of gas to the ordinary consumers. This was a very proper step to take, and one he should like to see taken on as many future occasions as possible. The reduction had affected their revenue for the half year to the extent

of about £400, and would further affect it for the current six months by the amount of increased dividend paid to the shareholders under the sliding-scale. But, as a matter of fact, notwithstanding the reduction, they had an actual increase in the amount of gas charged of £704; and if the £400 reduction were added it would be clear that their increase for the past half year, compared with the preceding period, would have been £1104. Considering the condition of trade generally, this was a very satisfactory statement to be able to make. There had been a smaller consumption of water. Residuals, however, had come to their assistance, for they had had an increase of £855. The coal carbonized had cost 1s. 1d. per ton less than in the first half of 1903; and this had assisted to the extent of £633. There had been an increase of 9,708,600 cubic feet, or 11·73 per cent., in the quantity of gas sold, which was accounted for by the facilities the Directors had put in the way of consumers, and the desire they had shown to meet their wishes. The report was adopted.

High Local Rates Check Liberality at Barnsley.

At the annual general meeting of the Barnsley Gas Company on Monday last week, under the presidency of Mr. E. G. Lancaster, J.P., the Secretary and Manager (Mr. W. W. Hutchinson) gave the shareholders some interesting comparisons of the chief items in the accounts. He said the manufacture of gas showed a reduction of £788, and the cost of distribution an increase in each department, amounting to £429. In rates and taxes there was a nominal decrease of £40; but this did not indicate any diminution in local rates, because they had gone up at the rate of £90 a year. The amount paid for management was £1004, against £1036—a decrease of £32; and the total expenditure was £21,189, which was less than in the previous year by £161, the profits being £32 more. On the revenue side there was a total sale of gas of 129,151,200 cubic feet, which was less than before by 4½ million cubic feet; and the receipts were £753 less. The receipts for residual products had increased. Coke had brought in £109 more, the total being £3509; tar, £372 more (total £1639); and ammoniacal liquor £94 more (total £1116). In these departments there was an increase over the preceding year of £576. The total income—£29,331—was within £130 of what it was for the year 1902-3. The sum carried to the profit and loss account amounted to £8141. In moving the adoption of the report and accounts, the Chairman said the cost of the manufacture and distribution of gas amounted to £17,395, or £359 less than before. This was easily accounted for by the decreased make, which saved the coal, the cost of which, however, showed an increase of 1s. per ton. The most favourable items were the results derived from the sale of residual products. Coke produced £100 more, tar £372 more, and ammoniacal liquor nearly £95 more—making £567. The result of the year's working was the payment of maximum dividends, with £135 to carry forward. In regard to the coal contracts, they would have an advantage of about 6d. per ton over last year, which, taking the quantity used, would save £373; and with the amount carried forward they should have a surplus next year of £500. They had decided, though some might think it was rash, to give their customers the benefit by increasing the discount allowed from 2½ to 5 per cent., which would absorb the amount named. They would have done this two years ago, but for the fact that their local rate assessment was increased to the extent of £450; making a total of £2000, or practically 25 per cent. of the whole earnings of the Company—the return to the shareholders being £8000. With regard to the town, they were constantly losing their large customers, but were gaining small ones; and in the out-districts the consumption of gas was growing very well. The motion having been carried, votes of thanks were accorded to the Directors and staff. The Chairman, in acknowledging, remarked that their thanks were really due to the staff, who had made it possible for the Directors to present such satisfactory figures.

Prudent Management at East Ardsley.

At the third half-yearly meeting of the newly constructed Gas Company at East Ardsley, the Chairman (Mr. R. S. Balden, J.P.) expressed his pleasure at being able to recommend a dividend at the rate of 5 per cent. per annum, which, he said, had been more than earned. There was a balance brought from the revenue account of £319, which should really be £519, as £200 had been charged to a suspense account from the previous half year. There had been 887 tons of coal carbonized, giving a yield of 9826 cubic feet per ton; and at the present time they were doing better than this. New regenerators had been erected by Messrs. R. Dempster and Sons, and were giving great satisfaction. Mr. Goodson congratulated the shareholders upon the brighter prospects of the Company, and said he thought the present balance-sheet reflected the greatest possible credit upon their Manager (Mr. J. J. Cooke). As to the loss of West Ardsley through the action of the Morley Corporation, he had no intention of allowing this matter to be lost sight of. Both undertakings had concurrent rights in the district; and he held that the East Ardsley Company had been treated in a most rapacious manner. The motion was carried. The Chairman having moved that a dividend at the rate of 5 per cent. per annum be paid for the past half year, Mr. Goodson remarked that 7½ per cent. had really been earned, but he thought the Directors were taking the correct course in only advocating a payment of 5 per cent. The motion was carried unanimously.

Good All-Round Progress at Maidstone.

A very satisfactory report was presented by the Directors at the annual meeting of the Maidstone Gas Company last Thursday. The business has continued to grow more rapidly than was anticipated; and the quantity of gas sold, compared with twelve months ago, shows an increase of 9 per cent. One great advantage the Company possess as compared with others—and the Directors emphasized it in their report—is that the day consumption of gas is more than equal to the night consumption throughout the year. This effect is produced by the large number of gas-engines and cooking and heating stoves in use throughout the district; and, in view of the competition of other illuminants, this is a great source of strength. The price of gas has been reduced to 2s. 4d. per 1000 cubic feet for ordinary purposes, and to 2s. 2d. for motive power. The revenue for the year was £51,459; the expenditure, £40,147; and the balance carried to the profit and loss account £11,312. The amount available for distribution was £12,527; and the Directors recommended a dividend of £3 16s. 3d, making with the interim dividend £7 12s. 6d. per cent. per annum. The Chairman (Mr. G. Marsham), in moving the adoption of the report, said the past year had been a most satisfactory one. The gas consumed showed an increase of nearly 23 million cubic feet, or 9 per cent., which compared favourably with a diminution in the previous year of 9½ millions, or 3⅜ per cent., mainly owing to the competition of the electric light. The amount received for gas, notwithstanding the reduction of 1d. per 1000 cubic feet in the price for lighting and of 2d. for motive power, had increased by £1677; the amount received for the hire of meters, stoves, and fittings, by £667; and that for residuals, by £1231. The consumption of gas by day—*i.e.*, from 6 a.m. to 6 p.m.—exceeded the consumption by night, which was an interesting and satisfactory condition, affording much stability to the Company. There had been a great increase in the employment of prepayment meters for cookers, heaters, and general use. The number of ordinary consumers was 3194, and of slot consumers 3893—increases of 131 and 938 respectively. The number of cooking stoves was 4635. The maintenance of incandescent burners was a large business; some 450 consumers having accepted the Company's terms for this work. Great satisfaction was given, and the system was very popular; the number of burners inspected reaching 3500. These figures more than compensated for the loss sustained on public lighting. The amount of gas unaccounted for had been reduced from 7·6 per cent. in 1903 to 5·99 per cent., representing a saving of 3,322,500 cubic feet. The powers conferred by their last Act of Parliament had been promptly used by the Directors in extending their mains to Aylesford, Eccles, and Burham, to Loose, and to Barming Heath. The cost of these extensions was £15,000, for which new capital was issued last year. The Directors were now proceeding with a further extension to Bearsted, at an estimated cost of £5000, for which capital stock would shortly be issued. He was glad to point out to shareholders, consumers, and employees of the Company that they had now an opportunity of taking up some of this capital at £140 per £100 stock, paying, at the present rate of interest, nearly 5½ per cent. Dr. Hoar seconded the motion; and it was carried.

Meeting Increased Business at Portsmouth.

There were several significant features in the report presented to the shareholders of the Portsea Island Gas Company at their half-yearly meeting on Saturday. In the first place the Directors announced that the progress made with the erection of the new works at Hilsea had been most satisfactory, several of the necessary buildings being ready for the machinery; that the large gasholder which was so unfortunately wrecked during its erection last autumn is now completed and ready for use; and that the new works will in all probability be in full operation next summer. In another paragraph the Directors informed the proprietors that, consequent on the very great increase of business in the hiring of cooking-stoves and slot meters, the repairing-shops at the town offices have been found inadequate to meet the pressure brought upon this department, and a range of workshops has been erected and brought into operation at the station for the purpose of executing the necessary repairs. So satisfactory have been the results, that buildings are in course of erection for the repair of the gas-meters. Finally, the announcement is made that Mr. Ashworth, the Company's Engineer, has, in addition, been appointed General Manager. Turning to the accounts, a sum of £25,000 was spent for capital purposes in the six months ending June; £18,311 being for buildings, plant, and machinery. This has more than exhausted the capital raised. The revenue for the half year was £93,954, and the expenditure £76,036; leaving £17,918 to go to the profit and loss account. The balance applicable for distribution was £41,423, and out of it the Directors recommended the payment of dividends at the following rates per annum: 13 per cent. on the "A" and "B" shares, 12 per cent. on the "C" shares, 10 per cent. on the "D" and "E" shares, and 5 per cent. on the stock—all less income-tax; leaving a balance of £25,510 to be carried forward. In moving the adoption of the report, the Chairman (Sir John Baker, J.P.) said he had only to tell the proprietors the old tale of increased business, as indicated in the statement they had all received. He dwelt on the fact that the manufacture of gas had reached no less a quantity than upwards of 600 million cubic feet; while the number of automatic meters had been greatly increased. The whole results obtained more than justified the outlay upon their new works, from which they were already obtaining a portion of the gas supply for the town. The works would, in the course of a few months, be in full use. In conclusion, he paid a warm tribute to the skill and experience of Mr. Ashworth. The motion was carried unanimously, together with another authorizing the payment of the dividends.

Liberal Policy Leads to More Business at Taunton.

At the annual meeting of the Taunton Gas Company last Tuesday, the Directors reported that the amount of profits available for distribution was £5522; and they recommended dividends of 5, 8, and 7 per cent. on the preference, consolidated, and new ordinary stocks, and of the last-named amount on the "yellow" shares. The payment of these would absorb £3310, and leave £2212 to be carried forward. They also announced that they had reduced the price of gas from 3s. 6d. to 3s. 4d. per 1000 cubic feet as from the 15th of June last. The Chairman (Mr. Jonathan Barrett), in moving the adoption of the report, stated that it was one of the best the Directors had ever presented, not only for the shareholders but for the consumers. The quantity of gas sent out during the twelve months was an increase of 6,381,600 cubic feet compared with the previous year. The further reduction of 2d. per 1000 cubic feet in the price of gas made altogether a decrease of 5d. during the past two or three years; and having reduced the charge by this sum, their statutory powers would enable them, if the profits permitted, to pay an extra 1 per cent. on the dividend. Notwithstanding the concession already alluded to, the dividend they had to declare was an increase on that of last year. Having made very favourable coal contracts for the future, they might anticipate as good a profit, if not a better one, next year. The Deputy-

Chairman (Mr. Reginald Barnicott) seconded the motion, and it was carried. It was also decided to pay the dividends recommended. The Chairman, in acknowledging his re-election, said he was glad to be able to state that the works of the Company were in a very satisfactory condition. Mr. A. Goodman, in proposing a vote of thanks to the Secretary and Manager (Mr. A. Edwards), remarked that he had for many years proved himself to be of real value to the Company. They felt their thanks were due to him for his long and able services. The motion included a vote of thanks to the staff. Mr. Edwards, in acknowledging the compliment, said his work for the Company had, to a large extent, been that of his life; and if any further incentive on his part were necessary, it would be found in the cordial support he always had from the Directors and shareholders. He also returned thanks on behalf of the staff, who, he said, were a very efficient body of workers. A special meeting followed, when the Directors were authorized to raise a sum not exceeding £5000, including premiums, by the issue of additional 7 per cent. new ordinary stock.

Record Profit at Wakefield.

The accounts presented at the half-yearly meeting of the Wakefield Gas Company on Monday last week showed that the revenue was £23,345, and the expenditure £15,952; leaving £7393 to be carried to the profit and loss account. The sum available for distribution was £9233; and the Directors, in their report, recommended dividends at the rates of 11½ per cent. per annum on 1000 shares of £25 each, and also on 3660 shares of £5 each, of 9 per cent. per annum on 7340 B5ths shares of £5 each, 8½ per cent. per annum on the 5000 new ordinary £10 shares fully paid, and of 4½ per cent. per annum on the £20,000 of preference stock—the balance to be carried to the next account. The Chairman (Dr. Statter, J.P.), in moving the adoption of the report, said that a year ago he was able to boast that they had made the largest profit ever recorded since the commencement of the undertaking. This year he was glad to tell the proprietors that this record had been passed, and that the Directors placed before them a balance-sheet with the highest profit ever realized in the history of the Company. They had made a profit of £9893, which enabled them to finally wipe out the suspense account, pay the same dividend as before, and add upwards of £800 to the balance of undivided profit. The suspense account was created in 1900, and arose out of the building of the new retort-house and the adoption of the system of inclined retorts; and this new plant being a replacement of some previously existing, the expenditure on it, to the extent of the value of the old plant superceded, had to come out of revenue and not out of capital. As the amount was £8840, it was utterly impossible to pay it out of one half-year's revenue; so a suspense account was created, to be cleared off as the profits allowed. A year ago, when they made their record profit, they paid £2000; bringing the amount down to £2500. Now, with the new record, they were able to finally get rid of the account altogether. While on this subject, he thought it was an opportune moment to indicate the Directors' future policy. Renewal of the rest of the retort-house and of the remaining old and obsolete hand-charged retorts would have to be faced later on:—in fact, they were watching with great interest improvements which were being developed and which, when complete, would enable them to go one better than the present inclined retorts. The Directors felt assured that the right thing to do was to build up the balance of undivided profit as they were able, so that when the time came to replace out of revenue the value of the old plant superseded, they might have all, or nearly all, of it ready beforehand in the shape of undivided profit, which, of course, was strictly revenue. They would then be hampered only to a slight extent, if at all, by a suspense account. The sale of gas had realized £1000 less than before; but the reduction to 2s. 6d. per 1000 cubic feet, commencing on April 1 last year, fully accounted for the difference. There was an increase in the consumption by prepayment meters of a million cubic feet. Residuals had come out well—there being a gain of £640; but the outlook was not promising. On the expenditure side, there had been a net reduction of £882, which was accounted for by the exercise of the strictest economy compatible with keeping the works in good order, and also by the absence of an unusual expenditure on the renewal of retorts which fell due last year. The net profit available for distribution was £9233, which enabled the Directors to recommend the usual dividends, and have a surplus of £2839, or about £800 more than in the preceding half year, to be carried to next account. They had also reduced the loan capital by £1000. The report was adopted, and the dividends recommended were declared. In acknowledging the usual compliment to the Directors, the Chairman moved a vote of thanks to the Engineer and Manager (Mr. H. Townsend, Assoc.M.Inst.C.E.), the Secretary (Mr. W. H. Parker), and their respective staffs, for their efficient services.

Water.

A Progressive Midland Company.

The report to be presented at the 103rd half-yearly meeting of the South Staffordshire Water Company on Thursday states that the number of houses laid on during the six months ended June 30 was 1658; making the total supplied 122,651. The gross amount of water-rates was £62,951, against £61,418 in the corresponding period of the previous year. After providing for interest on the debenture and preference stocks, the amount remaining for division (including £4349 brought forward) is £25,849; and the Directors recommend the declaration of a dividend on the ordinary stock at the rate of 6½ per cent. per annum, free of income-tax. The amount of this dividend being £20,636, there will remain £5213 to the credit of next half year. The accounts accompanying the report show that, of the total expenditure (£42,010), engine charges were £8167, maintenance of works came to £5630, and rates £6290. Appended to the Directors' report is one by the Engineer (Mr. H. Ashton Hill, M.Inst. C.E.), in which he states that all the plant is in substantial order and repair.

Criticism and Contentment at Sutton.

Though the Directors of the Sutton (Surrey) Water Company had an excellent report to put before the shareholders at the recent half-yearly meeting, it did not cause the proceedings to be carried through with the tranquillity one would have expected. The accounts showed that the gross receipts in the six months covered had been £10,077, and the expenditure £6515; leaving a balance of £3562. The profit, including £1950 brought forward, was £5512; and the Directors recommended the payment of a dividend at the rate of 10 per cent. per annum, free of income-tax. In his remarks, when moving the adoption of the report, the Chairman (Mr. W. E. Chambers) mentioned that the payment of the dividend would absorb only £3000 of the amount available; and therefore the Directors had placed £500 to the reserve fund, making it £9000, and carried the rest forward. This statement led Mr. Michell to inquire as to how the reserve fund was invested. He drew from the Chairman the confession that the fund was "only figures"—that no money had been put by to make a real reserve, but it was "in the business." This question settled, another was raised by Mr. Alexander Dickson, who was for some years Secretary of the Kent Water Company, in regard to the payment of the dividend free of income-tax. He asked the Chairman whether the Company had any Special Act empowering them to do this. The Chairman replied that this course had been followed ever since the Company had been in existence, and the Board entertained the idea that they would continue it as long as they could. Mr. Dickson urged that, by a recent decision in the Courts, companies such as theirs were not entitled to pay the maximum dividend free of income-tax, and suggested that in lieu thereof the Directors might consider the advisability of paying some of the back-dividends. Another proceeding criticized by Mr. Dickson was the temporary appointment by one of the Auditors, with the sanction of the Directors, of a gentleman to act with him in place of a deceased colleague. Mr. Dickson contended at some length that this was illegal; and he moved that the gentleman's name should be struck off the accounts. After some discussion, however, the motion was defeated—receiving the support of the mover and seconder only. The question of the audit came up again on the motion to appoint Mr. R. J. Ward to fill the vacancy. In reply to a question put by Mr. Dickson, the Chairman acknowledged that Mr. Ward was not a shareholder in the Company. The Secretary (Mr. P. Anderson) thereupon read a section of the Company's Act, from which it appeared that it was not necessary that he should be. Mr. Dickson observed that if he looked at the Companies Clauses Consolidation Act he would find that it was there provided that, where no other qualifications were required by the Special Act, the Auditor must have at least one share in the Company. In this case, "no other qualifications" were required by their Special Act, and therefore he concluded that Mr. Ward was not eligible. This view of the matter was supported by two other shareholders. The Chairman said the Board left it entirely to the meeting. The question was discussed at some length; but eventually the motion for the appointment of Mr. Ward was carried—only three voting against it. The payment of the dividend as recommended was sanctioned; and at the special general meeting the Directors were authorized to issue ordinary or preference stock within the limit of £50,000, exclusive of premiums.

SUFFOCATION BY GAS.

At the Westminster Coroner's Court, on Monday last week, Mr. Henslowe Wellington held an inquiry concerning the death of Luigi Pantellini (23), a cook, employed at the Carlton Hotel, who was found dead at his lodgings, King Street, Soho, under strange circumstances. Louis Novelli, of King Street, said he last saw Pantellini on the previous Thursday night, when he seemed as usual, and said he felt rather better than he had been. On Friday morning witness knocked at his door, as was his custom, but received no answer; and he then discovered that the door was locked on the inside. He burst it open, and discovered Pantellini lying on his bed dead. He did not at this time detect a smell of gas; but he did after he had apprised the landlady of what had happened. He then found that the gas jet was slightly turned on, but not alight. The window was shut, and there was no fire-place in the room. Alexander Gastano, chef at the Carlton Hotel, said he worked with Pantellini all day Thursday, and left him outside His Majesty's Theatre at 9.45 p.m. He worried about being so far from his native home, but otherwise he was in good spirits. He was very sober, and a good-natured fellow. Witness was called to his lodgings on Friday morning, and perceived a strong smell of gas in the bedroom. Pantellini had never threatened his life. Dr. Ludwig Freyberger, who made an autopsy, said death was due to suffocation by coal gas poisoning. The Jury returned a verdict of "Death by misadventure."

An inquiry was held in Belfast, on Monday last week, in regard to the death of Elizabeth Bowden, aged 30, a housekeeper. Dr. Robert Watts stated that about eight o'clock on the morning of the 13th inst. he was called to see deceased at her residence. She had been dead for some time before his arrival. In his opinion, death was due to poisoning by the inhalation of carbon monoxide in gas. Richard M'Cracken, brother of the deceased, gave evidence to the effect that she had resided for about eight weeks in his house. Her husband died about ten weeks ago; and since then she had been in a melancholy condition, and her mind seemed affected. On the morning of the above-named date, when he was passing her room, he detected a strong smell of gas. An inspection disclosed the fact that the gas was on full, escaping, the window closed, and the deceased in bed dead. Deceased had retired to bed the previous night perfectly cheerful. The Jury returned a verdict attributing death to poisoning by the inhalation of carbon monoxide through the deceased having left the gas turned on in her bedroom.

Messrs. Henry Greene and Sons, Limited, have received an order from the Glasgow Corporation for the supply of 750 new street lanterns. They have also obtained an order for lanterns for lighting Aldwych, as well as Parliament Square, by the high-pressure gas system.

EXPLOSION AT THE STRATFORD-ON-AVON GAS-WORKS.

An explosion, which might very easily have been attended with very serious consequences, occurred at the Stratford-on-Avon Gas-Works early on the morning of Sunday, the 14th inst. The exact cause cannot be ascertained, but a reasonable theory is that there was a small escape from one of the valves, causing an accumulation of gas under the flooring, and that it became ignited at the jet photometer. The accident occurred in the meter, governor, and valve house, which is situated at the rear of the yard, about 6.30 a.m.; and the result was that the walls were blown out, the roof fell in with a crash, and the whole building was completely wrecked. The extent of the damage is shown by the accompanying photograph. Fortunately the meter was uninjured; but considerable damage was done to the plant, though luckily the manufacture of the gas was not interfered with. Naturally the woodwork caught fire; and the promptitude with which the Engineer and Manager (Mr. J. S. Cranmer) and the men on the spot dealt with this is deserving of the highest commendation. Within a few minutes the private hose at the works was attached to a hydrant; and a good supply of water being obtainable, the employees were successful in preventing the conflagration spreading to the purifying-shed and the adjacent buildings. They were soon reinforced by the Stratford Fire Brigade; and the fire was quickly stamped out. The damage, estimated at about £300, is, we understand, fully covered by insurance. At five o'clock on Sunday morning Mr. Cranmer made a personal inspection of the works, and found everything safe; and the explosion occurred only two minutes after the foreman had left the meter-house.

EVESHAM CORPORATION GAS SUPPLY.

The Past Year's Working.

At the last Meeting of the Evesham Town Council, the Chairman of the Gas Committee (Alderman Lowe), in moving the adoption of the minutes, stated that the accounts of the Gas Department for the year ending the 31st of March had been audited; and he was happy to say they showed the works to be in a very favourable position. The expenditure on coal had been £1888; wages, £918; salaries, £278; and repairs and maintenance, £280. On the other side of the account they had by sale of gas for private and public lighting, &c., £4638; hire of stoves, £82; sale of fittings and work done, £795; and sale of residuals, £1061. It might be more interesting and intelligible if he gave the Council a comparison between the salient features of the revenue account for the year ended March last, and the year ended March, 1903. In the former year the expenses amounted to £4057, and last year to £4543—an increase of £486. The receipts in 1903 were £5870, and in 1904 £6613, or £743 more. The gross profit in the former year was £1812, and in the latter £2070—an increase of £257. The gross profit of £2070 had been dealt with in this way: £390 had been absorbed by capital account "B," representing 10 per cent. depreciation on stoves, lamps, mains, and plant; £18 had been transferred to capital account "C," being 10 per cent. depreciation on meters; and instalments of loan and interest, amounting to £869, had been paid off. This made a total of £1278 to be deducted from the gross profits; leaving a net profit of £791, against a net profit in the previous year of £486. Outstanding loans had been reduced from £5582 to £4913; and the total sum repaid by the Corporation since they acquired the works amounted to £10,086. The number of penny-in-the-slot meters at the present time was 146; shilling-in-the-slot meters, 93; and stoves in use up to March 31, 159—an increase of 55 on the year. The number of prepayment stoves to the same date was 73, or an increase of 40; the total number of stoves of all kinds in use being 232. The quantity of gas made during the year was 28,838,000 cubic feet; and that sold to private consumers, or used in public service or in the works, was 28,271,000 feet. This left the very small margin of 566,800 cubic feet unaccounted for—a percentage of only 1·96 on the make. Last year the percentage of unaccounted-for gas was 7. He believed the abnormal quantity unaccounted for last year was due to a broken main. He thought it only right to say that the works were excellently conducted by their Engineer and Manager (Mr. Percy H. Fletcher); and the satisfactory working was due mainly to him. The Mayor (Alderman Smith) said he thought it was due to Alderman Lowe that the Council should express to him their warm thanks for the lucid and satisfactory statement he had placed before them. Alderman Lowe attributed all the advantages which they were deriving from the gas-works to the action of the Manager. While he (the Mayor) was not prepared to dispute this to any extent, he thought it was due to the Chairman of the Gas Committee that he, too, should receive some share of their gratitude for the way the works were carried on.

OMAGH GAS-WORKS PURCHASE.

Council Still Disposed to Traverse the Award.

At an Adjourned Meeting of the Omagh Urban District Council last Wednesday—Mr. J. CADDEN in the chair—the subject of the award in the arbitration in connection with the purchase of the gas-works was again under consideration.

The CHAIRMAN proposed—"That the resolution passed on the 27th of June, that the Arbitrator's award fixing the price for the purchase of the Omagh Gas-Works be traversed at the coming Assizes, be rescinded." He said that since he had handed in this notice of motion they had all had sufficient time to consider the matter. When they were dealing with so important a subject as the transfer of the gas-works, they should lose no time in bringing it about; and it could only take place at the end of the half years June 30 or Dec. 31. By appealing it to the Assizes, they would only be delaying the transfer; and even after the question was decided it would be doubtful whether it would be immediately settled. Another thing they ought to consider was that, so long as this resolution remained on the books, they could not enter into negotiations to obtain the money to purchase the works with any company or body.

Mr. KIRK seconded the motion; remarking that it would be a very foolish thing for the Council to go on with the traverse.

Mr. CLEMENTS said he did not see why they should be in such a hurry to rescind their resolution, as they had not to take over the works until the 31st of December. He considered that there would be no advantage gained by the rescission, but, on the other hand, it might be disadvantageous.

Mr. ORR proposed that they postpone the matter for two months.

The CHAIRMAN said with the resolution on the books of the Council they could not obtain the necessary sum to enable them to take over the concern. He believed it would be proper to have this matter settled, and they could then proceed with the arrangements, and have everything ready to carry out the transfer on the 31st of December. If the resolution were wiped out, it would allow their Committee to proceed at once, and make arrangements to raise the money; but so long as it remained, they could not take a single step.

After some discussion, the motion was lost for want of the support of a two-thirds majority of the Council.

GAS AFFAIRS AT OSSETT.

Cheaper Gas for Cooking and Power Purposes—The Gas Manager's Salary.

At the last Monthly Meeting of the Ossett Town Council, the Gas Committee reported that at their meeting on the 26th ult. they had a report from the Gas Engineer and Manager (Mr. A. E. Mottram) showing that the quantity of gas made from April 1 to July 21 was 18,718,000 cubic feet—an increase of 264,000 cubic feet on the corresponding period of last year—and that the average make per ton of coal was 11,650 cubic feet, against 11,150 cubic feet. The gas sent out had been 3,937,000 cubic feet, compared with 3,614,000 cubic feet. It was resolved that a discount of 25 per cent. be allowed off gas accounts for motive power and cooking purposes, provided such accounts were paid within a month after becoming due; the alteration to take effect on the 1st of October next. The Manager was instructed to supply gas-engines on the hire-purchase system. The Committee further reported that they had had an application from Mr. Mottram for an increase of salary; and it was resolved to raise it by £50 per annum.

Alderman AUDSLEY, in moving the adoption of the Committee's minutes, remarked that the reduction in the price of gas for motive purposes was a step in the right direction. The Committee found that a large number of towns in Yorkshire had adopted a similar course. There was a rival coming, in the shape of electricity; and if the Corporation did not take some step, such as the one suggested, they might not hold their own. The discount offered would bring down the price of gas for motive power to about 2s. per 1000 cubic feet; and it was said that gas at this figure was the cheapest of all fuels. A similar reduction was being made in the charge for gas used for cooking purposes. A day-load was what was wanted, and the object was to secure a greater output of gas in the daytime, which would reduce the leakage to a considerable extent. The standing charges were even higher than the cost of producing the gas; and the greater the consumption the less would be the standing charges per 1000 cubic feet sold. The quantity of gas used for motive and cooking purposes in Ossett and Horbury was not very large; and the price had no doubt been a stumbling-block. The Corporation had therefore taken a broad view, and were prepared to sacrifice a little for the first year in order to encourage consumption. It had also been decided to supply gas-engines on the hire-purchase system, so that a small tradesman would have no need to spend a substantial amount of his capital in a gas-engine, but could pay for one by quarterly instalments. Referring to the proposal to increase the salary of the Gas Manager, Mr. Mottram informed the Committee that he was the worst-paid gas engineer in the district. He (Alderman Audsley) did not think the Corporation were wishful to have the best years of Mr. Mottram's life, and to under-pay him in comparison with other men in the same profession. He had received a letter from the Trades and Labour Council, and understood that a similar communication had been sent to each member. It was urged that the time was inopportune to increase the salary. Why? The rates would not be affected, but only the Gas Department; and if Mr. Mottram could not make £50 difference by a little extra exertion, because he was satisfied and was being treated fairly, the department had not that elasticity about it which he (the speaker) felt confident it had. When Mr. Mottram came to Ossett, the retort-house and works were in a condition which meant a loss of £1000 a year. In the first nine months they lost £760. All the alterations had been carried out without extra engineering assistance. Mr. Mottram not only drew the plans but superintended the work, besides carrying on his ordinary business. This showed him to be a man of no ordinary ability. He (Alderman Audsley) hoped the Council would view the increase favourably. No gas-works with either a larger or smaller output could show better results than Mr. Mottram secured.

Mr. BENTLEY expressed his pleasure in seconding the motion. He thought the Council would make a great mistake if they declined to recognize Mr. Mottram's ability.

The MAYOR (Alderman Fothergill) said he had received a letter from the Gas-Workers' Union, in which it was stated that the Committee of the Union considered the proposed increase of the Manager's salary to be "out of all reason, seeing that the majority of the ratepayers in Ossett have as much as they can do to pay the present rates, let alone any advance in rates, as it would mean more if he gets £50 a year advance."

A discussion ensued, in the course of which Mr. Mottram's ability was fully acknowledged; but it was considered that the present was not the time to recognize it in the manner suggested.

Mr. STEAD moved, as an amendment, that the minute relating to the Gas Manager's salary be referred back to the Committee, as he must protest against any further burdens being placed upon the public, in view of the state of trade in the town and the struggles of those who had to carry it on.

Mr. WILKINSON seconded the amendment.

Mr. WEBSTER, looking at the matter from a Trade Union point of view, supported the resolution of the Committee. He said the Unions tried to get for the workmen the same wages that were paid in other towns; and this principle should be applied to the Manager.

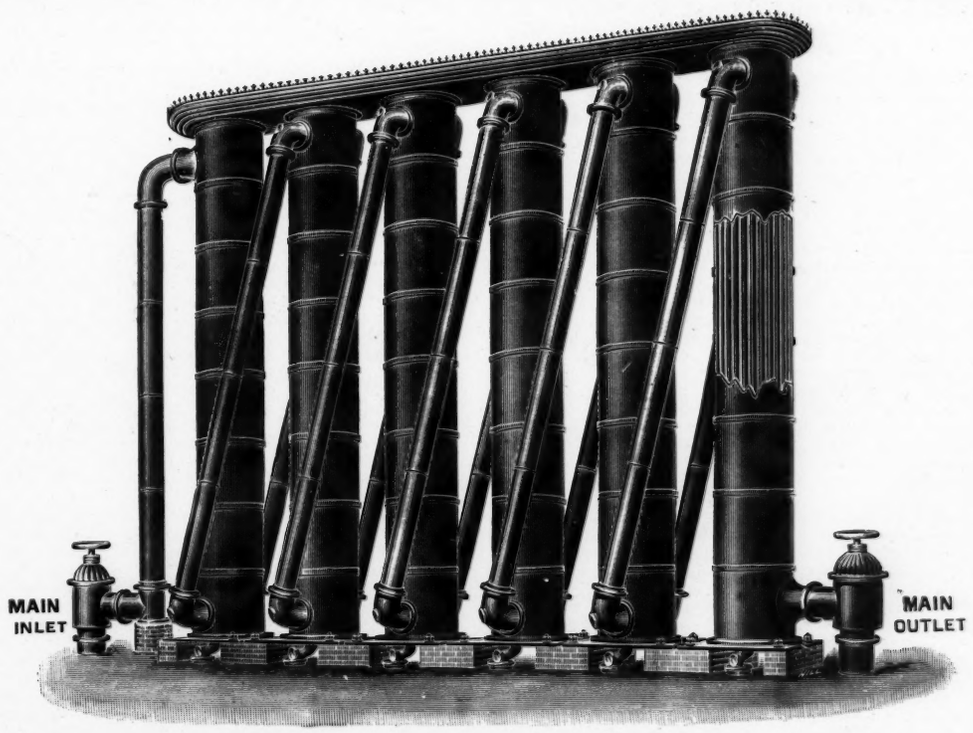
The MAYOR said he was prepared to support the amendment, not from any disrespect to the Manager, but because he did not like the way in which the matter was brought forward in Committee.

Alderman AUDSLEY, replying upon the discussion, expressed surprise at the tone of the letter from the Gas Workers' Union, and denied that the advance in salary would increase the burdens of the ratepayers. Referring to the remarks of the Mayor, he said Mr. Mottram would have applied earlier for an increase of salary had he (the speaker) not asked him to wait until the report on the past year's working appeared. Everything had been done straightforwardly.

Alderman TOWNEND said he proposed that the Gas Manager's salary should be increased because he thought that official was entitled to it;

CONDENSERS.

WATER COOLING.



ATMOSPHERIC.

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and it was his usual course, when he saw a servant was worth more, to take action without being asked.

On being put to the vote, the amendment was carried by 8 votes to 6.

Alderman TOWNEND asked if he would be in order in proposing an increase of £25.

Councillor TOWNEND: Leave it alone. If I were the Gas Manager I would not take it.

The minutes, as amended, were then passed.

DIFFICULTIES AT GREENOCK CORPORATION GAS-WORKS.

At the Meeting of the Greenock Corporation last Tuesday, the affairs of the Gas Department formed one of the leading topics of discussion. At a meeting of the Gas Committee on the 22nd of July, a report by the Sub-Committee was submitted, containing the following report by the deputation on hot-coke conveyors, who visited the gas-works at Newcastle-on-Tyne, Tynemouth, Manchester, Oldham, Birmingham, Shrewsbury, and Edinburgh: "We are of opinion that if hot-coke conveyors were introduced at Inchgreen, there would be a saving of manual labour, and consequently a saving of wages, and also that these conveyors are a proper adjunct to the stoking machinery already in operation at our gas-works. Of the various systems which we saw, we were most favourably impressed with those manufactured by the New Conveyor Company, Limited, Messrs. Dempster, and Messrs. West, as best suited for the requirements of our works. We therefore recommend the introduction of hot-coke conveying plant at Inchgreen without delay, and that the Works Committee be authorized to advertise for offers, and to report." It was agreed to deal with the recommendation at a future meeting. At a meeting of the Committee on the 9th inst., the balance-sheet for the year ending the 30th of June was submitted. Disappointment was expressed at the results of the year's working, particularly as there seemed no prospect of improvement. The Manager stated that the inefficiency of the machine stoking plant as compared with hand stoking had caused the results to be what they were. In connection with this subject, and on the motion of Dean of Guild Bennett, it was agreed "that a special meeting of the Gas Committee be called to consider the statements contained in the Gas Manager's paper as published on July 30th, 1904, and also to consider the balance-sheet."

Mr. J. M'ONIE, in moving the adoption of the Committee's minutes, said it would be noticed that they contained a report, which was signed by five individuals, himself among the number, concerning the introduction of hot-coke conveyors at Inchgreen. When the Committee was appointed, there were only four names put on it; but it was subsequently arranged that Mr. Steel should take his place if he (Mr. M'Onie) was not able to become a member of it. This arrangement was carried out. He was only able to visit one works—those at Granton; but from what he saw and heard there, he concurred in the whole of the report, so that he was responsible for it, and for his share of it. Mr. M'Onie concluded by asking that the words "and to report" be added to the last paragraph in the minute.

Mr. STEEL seconded the proposition.

Treasurer N. M. BROWN said that, taking the report on coke-conveyors in conjunction with the last paragraph in the minutes, which the Convener had just read, he thought it would be much better if the whole matter were held over. It seemed strange to add that machinery, at a cost, he supposed, of £4000 or £5000, when the Manager in the last paragraph of the minutes condemned it entirely. If the Convener would not agree to take back this matter for further consideration, he would move an amendment.

Mr. M'ONIE said he would stand by the minutes.

Treasurer BROWN said in that case he should move, as an amendment, that the recommendation of the Sub-Committee be not accepted. The question of hot-coke conveyors had been before the Committee for some years, more prominently, perhaps, in October and November last. The result of the introduction of stoking machinery had been a great loss. They were told when the machinery was introduced that it would effect a saving of from £800 to £1200 on wages. On inquiry, he found that for the first six months of last year, when the whole of the work was done by hand labour, there was a surplus. In that period the wages amounted to £3713. In the first five months of this year, when machinery was used, the wages amounted to £3650, or a difference of £63 in favour of machinery. But they had to add to this the coal used in the furnaces, the oil and waste, and the interest on the machinery. With the wages, this brought up the cost of carbonizing a ton of coal to 4s. 10d., against 3s. 1d. by hand labour—a difference of 1s. 9d. per ton. He cited the experience of Belfast, Edinburgh, and Aberdeen to show that only under certain conditions could the machinery be worked profitably.

Mr. SWAN said he noticed from the report that there was no reference at all to the cost of the introduction of the coke-conveyors. These might cost £100, or they might cost £4000 or £5000. If they passed the minutes that day, they were bound to proceed with the expenditure whatever it might be.

Dean of Guild BENNETT remarked that the Committee had a distinct recommendation from the Manager as to the introduction of hot-coke conveying plant at Inchgreen without delay. This was their Manager's recommendation; and he held that for himself he had never sanctioned the taking of any step to increase the facilities at Inchgreen, either by the introduction of machinery or the extension of the plant, without being assured of the Manager's concurrence in what the Committee proposed to do. But that day they had on one page of the minutes the clear and distinct recommendation of the Manager as to introducing coke-conveying plant; and they had it on record that he also attributed the loss on the year's working to the inefficiency of the existing plant at Inchgreen. He (the speaker) considered this extremely puzzling; and what way the Committee might find out of the difficulty he did not know.

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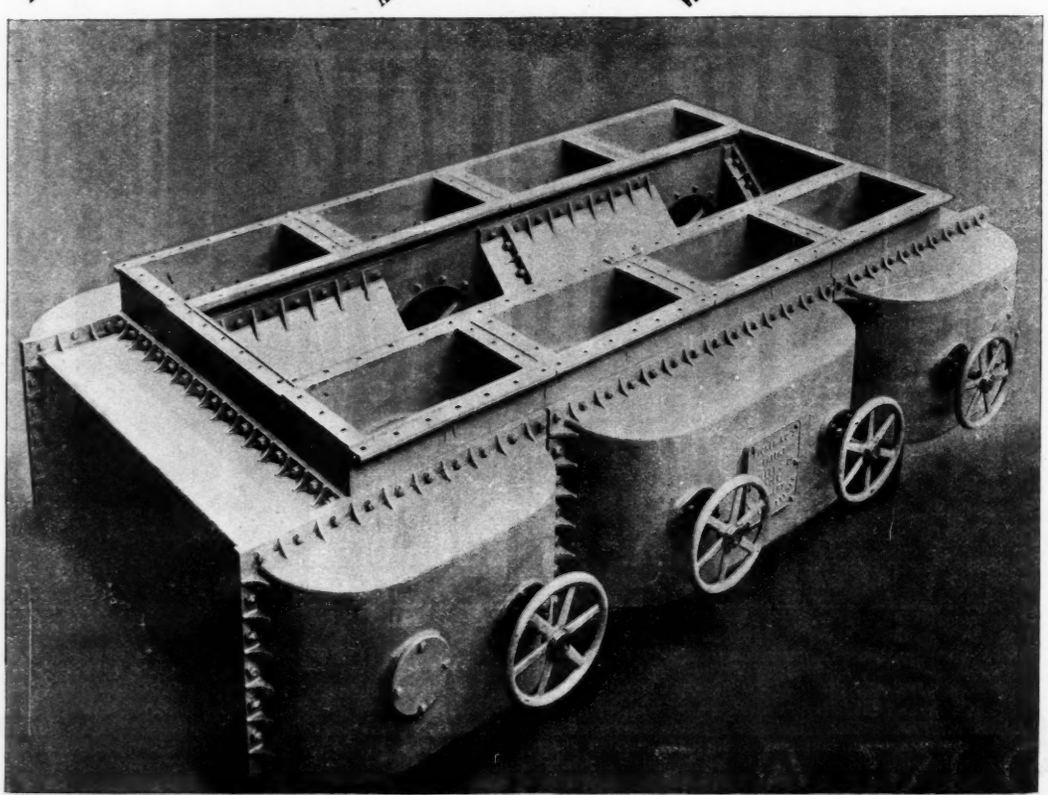

VIEW OF CENTRE-VALVE TO WORK 4 LARGE PURIFIERS, 24-INCH CONNECTIONS. N.B.—THIS IS NOT THE LARGEST WE MAKE, BUT LARGE ENOUGH TO BE INTERESTING.

Mr. BAILEY said it was quite proper that Treasurer Brown should wish delay about the coke-conveying plant; but it was unfortunate that he had entered into the larger question, when he knew that a Sub-Committee had been appointed to look into the whole subject of the advantages or disadvantages of their mechanical stoking machinery at Inchgreen. He maintained that they had plant at Inchgreen, when completed by the coke-conveyors now recommended, which would give all the results the maker contended for. The Manager had stated most distinctly that, in his opinion, they must have coke-conveyors. Therefore, what was the use of delaying? Let them as business men proceed. They had delayed far too long.

Mr. T. BAXTER thought too much time had been wasted already. With their eyes open to the fact that the matter would cost between £4000 and £5000, they some time ago approved of the proposal to introduce coke-conveyors. He did not think it would be quite fair for them now not to give the stoking machinery a proper chance. When Mr. Ewing was engaged as their Manager, he well knew that machinery was being introduced—some of it had even been put in. He accepted the appointment to do their work at Inchgreen by machinery, and he now condemned the thing he undertook to do. He thought the Manager ought, in his own interests and in those of the Corporation, to have done his best with the plant at his disposal.

Mr. A. M. CHALMERS emphasized the point that it was on the recommendation of the Manager that the coke-conveyors were thought of; and he (Mr. Chalmers) did not think the matter should be any longer delayed. He was convinced that they ought to have been put in when the charging and drawing machinery was installed.

Mr. T. MITCHELL said he was satisfied that stoking machinery would ultimately prove of great advantage to the ratepayers of Greenock. He was satisfied of this. But whether the present Manager continued to operate it, was quite a different matter. The Manager made the assertion, not only to them but elsewhere, that stoking machinery could only be made to pay in given circumstances, and that Greenock was too small to make it pay. Now he (Mr. Mitchell) had it on the best authority—from works not more than one-third the size of Greenock—that they were working stoking machinery all the year round, and making it pay. He had a letter in his possession which he received the previous week from a town where stoking machinery had been introduced by Messrs. West, which showed that it was giving ample satisfaction, and doing all that it was guaranteed to do. That place had not more than half the population or half the consumption of Greenock. He recently saw a paragraph in the "JOURNAL OF GAS LIGHTING" stating that in Dunfermline, where stoking machinery had been introduced, they had saved some 10d. per ton in the carbonizing of their coal. Dunfermline had only a consumption of 90 million cubic feet; whereas in Greenock last year it was 320 millions. This showed them, he thought, whether stoking machinery could be made to pay in Greenock. It could be made to pay in places one-fourth, one-third, and one-half the size of Greenock. Why not in Greenock? He was afraid that it would come to the parting of the ways.

Mr. M'ONIE, replying on the debate, said he was not surprised at Mr. Brown moving the amendment; for whenever they talked about gas, he could not get away from stoking machinery. Someone had said that the desire apparently was to introduce the new coke-conveyors in order to give the stoking machinery a chance. They would require to do a great deal more than that. They would need not only to introduce coke-conveyors to give it a chance, but have to make sure that they should have a Manager who would loyally and faithfully co-operate with the Gas Committee, and do what they wanted. If he did not agree with it, let him make his protest, but still do his work faithfully as the Committee thought proper. Someone had said the introduction of stoking machinery had been a great loss to Inchgreen. This was not correct. It was the ill-using and the mismanagement of the stoking machinery that had proved the great loss. Mr. Swan was afraid of the large expenditure on very slender grounds. If he would read the minute, which stated that "we therefore recommend the introduction of hot-coke conveying plant at Inchgreen without delay, and that the Works Committee be authorized to advertise for offers and to report," he would be reassured. Had the words "and to report" not been there, he (Mr. M'Onie) would have said they were opening their mouths and shutting their eyes; but as it was, they had the whip in their own hands, and they had ample power to do as they wished. If, upon receipt of tenders for the coke-conveying machinery, the Committee thought the game was not worth the candle, he would be the first to move that the proposal be not gone on with.

There being no seconder for the amendment, it fell to the ground, and the minutes were adopted.

Commenting upon this matter, the "Greenock Telegraph" on Wednesday, in a leading article, said: "Mr. Ewing has, it appears, expressed his opinion that the Greenock Gas-Works are too small to make stoking machinery pay. But yesterday Mr. Mitchell showed that this was a mistake; that in Dunfermline and other places smaller than Greenock stoking had been worked successfully, and had brought a profit. But the most grave indictment of our Gas Manager came out of the mouth of his own municipal superior, Mr. M'Onie . . . Either the Manager is seriously in the wrong, or, if not, then the town is being run by a pack of befoozled thick-heads. There must be a change for the better soon. It will be difficult for the public to believe that ex-Bailie M'Onie and those who agree with him have not a good case."

The Herne Bay Water Company have declared a dividend at the rate of 5¾ per cent. per annum on the ordinary stock for the half year ending the 30th of June; and the West Surrey Water Company dividends at the rate of 7 per cent. per annum on the 7 per cent. shares, and 8 per cent. per annum on the 10 per cent. shares, for the same period.

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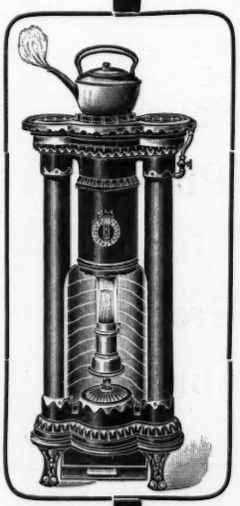

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NEW OFFICES OF THE BRISTOL GAS COMPANY.

In the course of the address of the Chairman of the Bristol Gas Company (Alderman J. W. S. Dix) on the occasion of the half-yearly meeting, reported last week, reference was made to the new offices which are being erected for the Company adjoining the Colston Hall. According to an illustration in one of the local papers, the Architect (Mr. W. V. Gough) has designed a building which has a very imposing elevation in the Renaissance style, but without excess of ornament; and its erection will afford the Corporation an opportunity of effecting some improvements in the thoroughfares in the immediate vicinity. The basement will be mainly devoted to the storage of cooking and other stoves; the business of the Company in this department being constantly on the increase. A certain portion, however, will be set apart for strong rooms, principally for the account-books. The ground floor will include a handsome entrance hall, from which a staircase will ascend to the upper floors. The hall will communicate directly with a spacious general office and show-room. In the latter will be exhibited samples of gas-stoves, gas-heating appliances, as well as gas-fittings. The adjoining room will be a special feature, and may be darkened for the purpose of exhibiting the effects of the various methods of lighting by gas. The remainder of this floor will be occupied by the offices of the Secretary, Superintendent, Accountant, Cashier, and the staff generally. The floor immediately above will contain a handsome Board-room, with Directors' room adjoining, the offices of the Engineer's department, the clerks' dining-room, with other rooms for occasional use by the staff, and spacious lavatories. The upper floor will contain a department to be used for teaching cookery and the practical exhibition of the use of the various kinds of stoves lent on hire by the Company. A caretaker's apartments will also be on this floor, and the workshops for repairing stoves, meters, &c. The various departments will be well supplied by lifts communicating with the several floors, and all worked by hydraulic power. The ventilation and heating of the premises will be by the most improved modern methods.

The external main frontages of the building will be faced with Bath stone; the lower parts (those likely to be damaged) being of granite of several tints. The balustrade facing the principal frontage will be surmounted by handsome lamp standards, to exhibit methods of lighting by gas. The centre of the façade will be crowned by a clock turret, the dials being illuminated by gas. The interior of the building will generally be plainly finished, but in a substantial manner. The more ornamental portions will be the entrance hall and staircase, the general office, and the Board-room. The staircase and hall will have "Hopton wood" stone dadoes, and marble will be used in the shafts and arches which occur in this part of the building. The walls of the general office will be lined with tinted glazed bricks. The Board-room will have wall linings and fittings of teak, and a handsome coffered ceiling in plaster. As already mentioned, it is proposed to make a new departure, so far as gas companies are concerned, by the introduction of electric lighting on the basement floor. A complete installation, worked by a gas-engine, for the production of energy for light and power, will be laid down. Consumers of gas and the public generally will thus be able to receive practical proof of the economy to be effected by private persons and firms producing electricity by gas for motive power.

THE MUNICIPAL OWNERSHIP OF GAS-WORKS.

Sir George Livesey on the Treatment of Officials.

In the "JOURNAL" last week (p. 480), we gave the report presented by Sir George Livesey to the Bishop's Stortford Urban District Council on the subject of the suggested acquisition by that body of the undertaking of the Bishop's Stortford Gas Company. Sir George was present when his report was before the Council, and was questioned on its most important points. In the course of the interview, he took the opportunity of expressing to the Council his views on the general question of municipal management; and we now give his remarks on the subject by way of supplementing what has already appeared.

In municipal gas undertakings, said Sir George, the interests of the ratepayer and the consumer were antagonistic; it was to the interest of the ratepayer to get as big a price for gas as possible. Under a company, the interests of the consumer and the company were identical. Gas was sold as cheaply as possible, because thereby the dividends could be increased. He claimed to have been all his life the friend of the consumer of gas. His father before him, and he, had taken into consideration the consumer; and they had had their reward. The object of the ratepayer was to charge as much as possible—as much as the consumer would put up with. If all the gas undertakings of the kingdom were in the hands of municipalities, there would be no further reduction of price at all. The big places—Nottingham, Birmingham, and Leicester—simply sold gas as cheaply as their neighbours, and thought there was no need to reduce the price further. The private companies kept the price down, and compelled the municipalities to do so to some extent. One of the members put this question to Sir George: "In your report, you say the purchase would be to the benefit neither of the ratepayers nor the consumers. Don't you think you could alter that opinion?" The reply was: "As to consumers, the progress of the town and the increase of consumption might be such that, after the reduction of the debt—by the consumers, not the ratepayers—the time might come when it would be to the benefit of the ratepayers, but never to the consumers." He added, in answer to another question, that it would decidedly not be for the benefit of the ratepayers at present. His attention having been directed to the case of Clacton, he said that if the Council had not taken such a large amount for the relief of the rates, they could have reduced the price further. It was most important for the public interest to keep the

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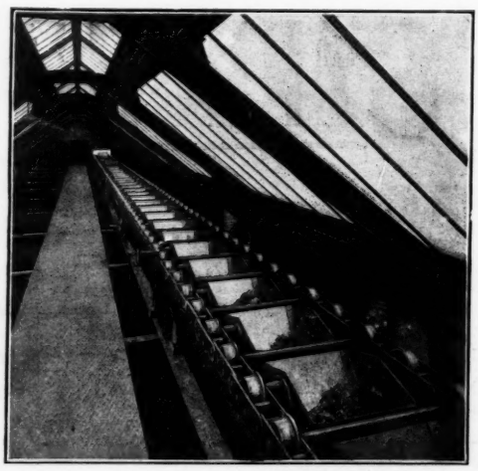

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price of gas down, and the general public interest was superior to the mere interest of the ratepayer. The ratepayer's interest was to keep the rates as low as possible, and charge as high as he dare for gas. In reply to a question put by a member, Sir George repeated that he did not think the Council would work the concern more economically than the Company, except by saving the Directors' fees; and experts on the Board were worth £100 a year. Indeed, he did not think they would manage it so well. The staff, he added, never liked municipal masters. Municipalities would not pay enough to get good men; and when they got a good man, they often treated him shabbily. There was always trouble about increasing salaries. If an extra £50 were wanted, somebody opposed it; and it came before the public in the papers, making it very unpleasant for the servants concerned. With this parting shot the conference closed.

SALFORD CORPORATION WATER SUPPLY.

New Agreement with Manchester.

At the Meeting of the Salford Town Council last Wednesday, they considered the report of a Special Committee appointed in 1899 to negotiate with the Manchester Corporation as to the price and pressure of the water to be supplied by them to the township of Salford. The Committee was, in August, 1900, empowered to continue the negotiations, and had agreed upon the following terms, subject to the approval of the Councils of the city and borough: (1) "The Manchester Corporation to supply to the township of Salford all the water required at the price of 4¼d. per 1000 gallons. (2) The Manchester Corporation to construct a 24-inch main from the Denton reservoir to Regent Road Bridge, for the exclusive use of the Salford Corporation, at an estimated cost of £32,000, the Salford Corporation to pay £26,000 towards the cost. (3) The Salford Corporation to pay to the Manchester Corporation the sum of £250 per annum towards the maintenance of the main. (4) That this arrangement shall cancel all previous arrangements between the two Corporations, and be embodied in a formal agreement." The Special Committee recommended the Council to accept these terms.

Mr. FODEN moved, as an amendment, that the report of the Committee be referred back for fuller particulars with regard to the position Salford was in previously as to its water supply, and the terms on which it was furnished; also as to the agreement the Water Committee had made with Manchester in 1899, and in what position the borough will stand under the agreement now proposed.

Mr. JACKSON seconded the amendment.

The MAYOR (Alderman Stephens) said he was satisfied it was to the interest of everybody that they should accept the arrangement as it now stood. It was useless to bring up a past during which the Council were at daggers-drawn with a community who were now their friends. The arrangement proposed was the result of long and careful negotiations, most amicably conducted on both sides. He considered it was equitable, and one which he believed Salford would have no cause to regret. What the borough needed was an ample supply of water, with an adequate pressure and at a reasonable price; and these desirable objects would now be achieved.

Alderman R. W. JONES criticized the arrangement proposed to be entered into from a financial point of view. He thought the existing reservoirs might be made to serve their purpose better than they had done in the past.

Upon a division, the report of the Committee was adopted by 32 votes to 6.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Glasgow Town Council on Thursday adopted a long series of minutes of Committees connected with the Corporation gas undertaking. Among them was one which stated that the new gas-works at Provan are nearing completion, and that it is proposed to formally open them in September. A Committee has been appointed to make arrangements for the occasion, which will be one of much interest—necessarily so when it is considered that the largest gas-works ever erected in Scotland, and probably the largest which ever will be erected, will have become an accomplished, though by no means a completed, undertaking, for the Corporation are, happily, far from finality in their provision for the gas supply of the city.

It is probably more with a feeling that it is their duty to commemorate the connection of their late Engineer, Mr. William Foulis, with the gas supply, than anything else, that the Corporation have agreed that a bronze medallion of him is to be erected in a suitable place in the Provan works; but the site selected will, at the same time, emphasize the fact that these works are truly Mr. Foulis's monument. Whatever may be the future fortunes of the great gas undertaking in Glasgow, coming generations will be obliged to admit that the Provan works are the product of one who had a great mind, and a strong will in the carrying out of his purposes. When personal recollections of him have faded, his works at Provan and elsewhere will stand as an abiding memorial of him.

Another minute stated that on June 29 the Town Clerk reported that the Corporation had adopted a resolution to the effect that Station Managers, when engaging extra men for the winter months, should be instructed to confine such engagements to applicants who could show a record of twelve months' continuous residence in Glasgow at the time of engagement, that, of such applications, preference should be given, as far as possible, to ratepayers; and that the resolution had been remitted to the Gas Committee for consideration and report. The Committee then agreed to continue the consideration of the subject. On

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	800,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 4,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Thursday, Mr. Burgess, at whose instance the resolution was passed, asked if it was the fact that men who had been labouring in the new gas-works at Provan for the last twelve months had all been paid off, and that strangers to the city, and who were not ratepayers, had been taken on. After some discussion, it was agreed to bring the matter up at the next meeting of the Committee.

It is much to be regretted that a serious state of matters has arisen at Greenock. We have known all along that Mr. W. Ewing, the Manager, prefers hand to machine stoking for his works, and that he has an installation of machinery which was there before him. He has been of opinion throughout that he could do better work without it; but the Corporation, who had spent money upon its erection, have naturally been anxious that it should not stand unproductive. It has consequently been worked. Now, at the end of the financial year, there is a deficit, the amount of which has not yet been stated; but it is announced that the Manager attributes it to the inefficiency of the stoking machinery. The Committee take the view that it is not the machinery which is inefficient, but the working of it. This is a clear issue. It is also one in which it would be difficult for either of the parties to make good their contention, and the controversy would still remain in the region of opinion; it being next to impossible to import it into the domain of fact. But a fresh element has been introduced into the controversy. As the meteorologists say, a depression has been formed outside the existing cyclonic area, the barometric gradients around which are very steep, with the result that gales from one or other (conjectural) direction are imminent. They have already begun to blow. The fiercest, and in the circumstances the most unfortunate, is that which comes from Mr. M'Onie, the Convener of the Gas Committee. The Convener says they want Mr. Ewing to show them the front and not the back of his hand, and that they look for a loyal and faithful support of the Committee's efforts. This is certainly, on all grounds, a reasonable proposal. The mere utterance of it shows what a wide chasm exists between the Manager and his Committee. But we cannot overlook the fact that we have not, as yet, the Manager's view of the situation. Neither have we the amount of the deficit, which seems to be the exciting cause of the Convener's hostility; nor, indeed, any information as to what the stoking machinery might have been capable of doing if worked according to the notions of the Committee. For these reasons, and also for the further reason that the Gas Committee are to hold a meeting for the special purpose of considering it, we must keep an open mind on the whole subject, contenting ourselves with the expression of our regret that so serious a state of matters should have arisen. There is, however, this which may be said, that the new disturbing element is not the stoking machinery, but the proposal to introduce a hot-coke conveyor. It is upon the Committee's recommendation to proceed with the obtaining of estimates for the conveyor, taken in connection with Mr. Ewing's paper at the recent meeting of the North British Association of Gas Managers, that matters have come to an open rupture. Now, whatever may be the merits or otherwise of the stoking machinery, the hot-coke conveyor, which is not yet estimated for, cannot be the cause of the deficit on the past year's working. Consequently, we must conclude that there is more in the dispute than we yet know of. There are more conveyors in the market than one; and when Mr. Ewing is accused of facing more ways than one, we must, in justice to him, recognize that we do not know whether he has his mind's eye upon one and the Committee theirs upon another. This is a point which Mr. Ewing alone can clear up; and if this surmise should prove to be correct, it would clear him. But it would not remove the difficulty of the conflict between him and the Corporation over the deficit. As to this deficit, I may point out that a year ago the price of gas was reduced by 5d. per 1000 cubic feet, which may account for a fall of revenue sufficient to explain a deficit. It may, therefore, turn out, when we have had an opportunity of hearing Mr. Ewing's side of the question, that he could have done better if he had had his own way.

The Forfar Town Council had before them on Wednesday the accounts of the Corporation Gas Department for the past year. Mr. M'Dougall, the Convener of the Gas Committee, said it would be remembered that last year they had a surplus on the twelve months' working of something like £640, and, while voting this surplus to certain funds, they reduced the price of gas by 3d. per 1000 cubic feet. They had had a very prosperous year, and were in the satisfactory position of having a balance in hand of £543. This showed that the gas-works had been efficiently as well as economically managed. This year they intended to utilize the surplus for the benefit of the current year's gas accounts. During the past year, the consumption of gas had gone down half-a-million cubic feet, which was accounted for by the introduction of electric lighting into one of the mills. He urged the increased use of gas-cookers by householders as a means of improving the demand for gas. The accounts were approved, and the price of gas was fixed at 3s. 4d., which is a reduction of 5d. per 1000 cubic feet. Mr. J. Baxter, the Manager, is certainly to be congratulated upon the success which has attended his management of the gas undertaking in Forfar, and more especially so when we consider the troubled state of affairs in Forfar before he went there.

The Coatbridge Gas Company, at their recent half-yearly meeting, declared dividends at the rate of 11 per cent. on the original stock of the Company, and £7 11s. per cent. on the various issues of new shares, less income-tax.

The Dundee Town Council on Thursday approved of an agreement which has been come to with the Corporation of Carnoustie for the augmentation of the water supply to the smaller burgh. The present supply to Carnoustie is derived from works which they have erected at a cost of £20,000; and they are sufficient for all purposes, except in dry summers—that being a period of the year when the population is very largely increased by visitors. These works are to be continued in use, being taken over by Dundee next year, by which time their capital value will be reduced, by the operation of the sinking fund, to £11,255. The burgh of Carnoustie is to be included in the area of the Dundee supply; the works and debts of the Carnoustie undertaking are to be taken over; and the charge for water is to be 9d. per £1 higher than in Dundee. At the end of 25 years, the owners' extra rate of 4½d. in the pound is to be reduced to 1d.; it being anticipated that by that time

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Dundee will be compensated in the matter of the paying off of the capital account. The only new works which will be required will be the construction of a small reservoir and filter-beds, at an estimated cost of £3272; but this would have been required to be done by Dundee in any event, for the better supply of Monifieth and the district.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 20.

Sulphate of Ammonia.

There has been improved demand, buyers showing a greater readiness to avail of the moderate level of prices reached, and parcels offered have found a ready sale at some improvement towards the close. The closing quotations are £11 12s. 6d. per ton f.o.b. Hull, and £11 15s. to £11 17s. 6d. per ton f.o.b. Liverpool and Leith. Purchases have also been made for September at spot prices. There has again been large inquiry for October-December and for October-March delivery, but whilst buyers' views remain at about £12 per ton first-hand business has been practically impossible, and any orders placed have again been taken speculatively.

Nitrate of Soda.

This article has been rather quiet, but spot prices remain at 10s. and 10s. 3d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Aug.* 19.

Tar Products.

Markets continue in a very dull state; and there seems little, if any, business doing. Pitch continues weak, although there have certainly been more inquiries, both in South Wales and on the Continent, for early delivery. It would seem as if some of the consumers had come to the conclusion that prices had fallen sufficiently low to warrant their purchasing. There are still, however, offers being made, in Belgium and South Wales, at very low prices indeed, for both prompt and forward delivery; and there appears anxiety on the part of dealers to secure forward business, even at low prices. The London market remains unchanged; but there is really no business doing—the makers' quotations being prohibitive just at present. The principal weakness has lately been in the Lancashire district, where makers appear anxious to sell for both prompt and forward delivery; and in some instances very low prices have been accepted. It would certainly seem, however, that the fuel trade is very brisk, judging by the reports from the Continent; and there do not appear to be any large stocks in the hands of the English tar distillers. It is, of course, difficult to ascertain whether the Continental production has increased, as if this is the case it may account to a considerable extent for the depression recently prevailing. In benzol, some further quantity was sold at 9d. per gallon f.o.b. London; but rather more than this has been paid in the North by aniline makers for home consumption. It is reported that business in anthracene has taken place for delivery all over next year in a Continental make at the equivalent of about 1¾d. per unit; but full particulars have not transpired. English makers are still very firm, and will not consider anything less than 2½d. for best "A" quality, 45 per cent. The market in solvent naphtha continues steady; and it would seem that several of the large stocks have been considerably reduced during the past few weeks, as there is not that desire to sell on the part of makers in the North of England which prevailed some little time ago. In carbolic acid, consumers still continue to depress the price of crude, and report having purchased 60's at 1s. 9d. for prompt delivery. Makers, however, appear fairly well sold and are, as a rule, indifferent as to the position of the market. It would therefore seem that the recent low prices have been accepted by dealers who probably bought for forward delivery. There is nothing fresh to report in crystals; and business appears very quiet. The demand in creosote seems fairly good, especially in the North of England; but consumers will not pay 1¼d. per gallon at makers' works at present—in fact, it is reported that a fair quantity was sold in Yorkshire at rather under 1⅜d. London makers are very firm in their ideas, and talk of advancing their price to 1¾d. per gallon.

The average values during the week were: Tar, 17s. to 21s. 6d. Pitch, London, 30s.; east coast, 29s.; west coast, 26s. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. to 6⅝d. Crude naphtha, 2⅝d.; solvent naphtha, 7d. to 8½d.; heavy naphtha, 9½d. to 10d. Creosote, London, 1 $\frac{9}{16}$d. to 1⅝d.; North, 1⅝d. Heavy oils, 2 $\frac{1}{16}$d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 10d. Refined naphthalene, £4 10s. to £8; salts, 21s. 6d. to 22s. 6d. Anthracene, "A" quality, 1⅜d. to 2d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market continues very quiet, and there is an absence of business for prompt delivery, although there is a fairly good inquiry for forward. Beckton still quote £11 18s. 9d. for prompt delivery; but there is no business doing at this figure. The South Metropolitan Company are asking £12 for prompt; but buyers are not at present inclined to pay this price. In Leith, business is reported at £11 15s. for prompt delivery; but only to a limited extent. There is, however, a very good inquiry at this port for November-March; but makers at present decline to entertain business over this period. In Hull, small sales are reported at £11 11s. 3d. for prompt shipment, and there is a fairly good inquiry forward, although makers do not at present care to offer further than September.

New Departure in Gas Supply.—Gas will be turned on for the first time next Wednesday at the new works of the Royston Gas Company, near Barnsley, after which the proceedings will be followed by a banquet. A novel feature in the event is that no gas whatever will be manufactured on the works; the whole supply to the town being obtained from neighbouring coke-ovens, and afterwards purified and enriched.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

There is no change to report in the general condition of the coal trade in this county. The slightly increased demand for house coal which set in last week has been strengthened, owing to the fall in temperature and the broken weather experienced. For engine coal, there has been only a dull inquiry. Only those acquainted with the Lancashire holiday system can realize what an effect this has on trade generally. This week some 10 or 12 Lancashire towns, besides two or three in the neighbouring counties of Cheshire and Derbyshire, are holding their annual "wakes," which brings the mills and workshops to a standstill. Coal for shipping moves off very slowly; and there is only a moderate inquiry for forge and steam purposes. The shortening days are beginning to tell on gas production. Reports from all quarters show that the 5 per cent. reduction in coal miners' wages is being acceded to. The pits are still working short time, and will probably continue to do so until full time is resumed in the cotton mills. Last week's quotations remain unchanged.

Northern Coal Trade.

There is a rather better demand for coal, and the prices are firmer for some qualities, though the supply is generally ample for all needs. In the steam coal trade, best Northumbrian qualities are steady at from 10s. to 10s. 1½d. per ton f.o.b., second-class steams are 8s. 9d. to 9s., and steam smalls 3s. 9d. to 4s. The collieries seem now to be working fuller; but there is still an occasional idle day. Durham coals are plentiful; but the demand is now appreciably increasing. In gas coals, the fuller demand usual at this season seems to be setting in more steadily; but there is an abundant supply for all needs yet, though the best gas coal collieries do not seem to have very much coal for occasional calls. Prices of Durham gas coals vary now from 7s. 10½d. to 8s. 3d. per ton f.o.b. Contracts vary a little with the quality and the time of the delivery, but are generally from 7s. 9d. to 8s. 2d. per ton, unless under exceptional circumstances. As to coke, the market is steady; and while gas coke is beginning to be in larger production, there is a steady demand, both for home use and for export. The price varies from 13s. to 13s. 3d. per ton f.o.b.

Scotch Coal Trade.

Coal is moving off more freely; there being a disposition to lay in stocks so as to be ready in the event of a strike among the miners taking place. This scarcely affects the market, as the stuff being handled is under contract. Consequently the general market is practically unaffected. The prices quoted are: Main 7s. to 7s. 3d. per ton f.o.b. Glasgow, ell 7s. 9d. to 9s. 3d., and splint 8s. 3d. to 8s. 9d. The shipments for the week amounted to 247,991 tons—a decrease of 7374 tons upon the previous week, but an increase of 3329 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,875,928 tons—an increase of 128,457 tons upon the same period of 1903.

Leeds Corporation Gas-Coal Contracts.—At a meeting of a Special Committee of the Leeds Corporation Gas Committee on Friday, arrangements were made for completing the contracts for the year's coal supplies, amounting to 250,000 tons of coal, cobbles, and nuts. A few weeks ago contracts were settled for 200,000 tons; and on Friday the remaining 50,000 tons were placed. As the smaller quantity was secured at about the same rate as the larger—namely, at between 6d. and 8d. less per ton than the price ruling a year ago—there will be a saving of between £8000 and £10,000 in the coal bill for the current year.

Breakdown at the Islington Electricity Works.—An unfortunate incident occurred at the Islington Electricity Works on Wednesday night, resulting in the complete shut-down of the supply for a short time. The explanation given by the "Electrician" is that "an armature coil on one of the alternator coils burnt out, and, in consequence, it was necessary to switch off the entire plant and to parallel the machines again." Considerable inconvenience was, of course, caused, as the time of the occurrence was 9 p.m.; but it was not anything like so serious as it would have been had the Borough Council not largely adopted incandescent gas for the public lighting.

Incandescent Gas Lighting in Glasgow.—In connection with the change of the system of public lighting in Glasgow from flat-flame to incandescent burners, the Lighting Committee of the Corporation have let contracts for the supply of lanterns as follows: Messrs. J. G. Carrick and Co., Glasgow, 2200; Messrs. G. Bray and Co., Leeds, 1500; Messrs. R. Laidlaw and Son, Glasgow and Edinburgh, 750; Messrs. Henry Greene and Sons, Limited, London, 750; Messrs. W. M'Coll and Sons, Glasgow, 350; and Messrs. R. C. Murray and Co., Glasgow, 450—making 6000 in all. The lanterns are to be square in shape, with copper frames. The work of making the change is to be begun immediately. Estimates are not being obtained for the burners. They are being ordered privately.

Lamplighters' Wages at Audenshaw.—At the monthly meeting of the Highways Committee of the Audenshaw District Council on Thursday, the question of the lamplighters' wages was discussed. A difficulty arose with one of the lamplighters with regard to the substitution of incandescent lights for oil-lamps along a certain road. It was contended by the officials that there was less work to do, and it was proposed to readjust the wages of the lamplighter referred to, and also the other lamplighters, and to rearrange the number of lamps which each would have to light. The first-named lamplighter demurred, and ceased to light his lamps for a few nights; the others being lighted as usual. An arrangement was come to whereby the lamplighters are to continue to light the lamps pending inquiries as to the rate of wages paid by surrounding authorities, when a report will be submitted and the wages settled at a subsequent meeting.

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Galway New Water-Works.—A satisfactory report of progress in connection with the new water-works scheme for Galway was presented at the last meeting of the Urban District Council by Mr. Perry, the Engineer, who mentioned that the new pumping-engine which would enable a daily supply of 700,000 gallons of water to be given to the town had been received from the contractors, and would be put into position without delay. The excavations for the new reservoir had been completed, and a large quantity of piping put down.

Matlock and District Gas Company.—Under the Act obtained by this Company in the past session, the Limited Company, working under a Provisional Order, has been dissolved and a new Company incorporated. The Act provides that the Company's area of supply shall be increased; and authority is given them to build a tramroad between the works and the Midland Railway, and largely increase their capital, which is consolidated, and the standard dividend fixed at 5 per cent. The Company are authorized to manufacture power gas; and generally it is considered that the Act contains all the best provisions of recent gas legislation.

Paris Water Supply.—The Paris Correspondent of the "Standard" says that a deputation from the Municipal Council left for Germany on Saturday. In the course of a visit which is to extend over several weeks, the delegates are to inspect the methods adopted for supplying water to Berlin, Hamburg, Frankfort, and several other large towns. The problem of increasing the water supply of Paris is becoming each year a more pressing one. The existing sources are not only insufficient, but their purity in several cases is not above suspicion; and during last week the Municipal Council again thought it advisable to issue notices warning all inhabitants to boil the water intended to be used for drinking purposes.

Gibraltar Water Supply.—In the report for Gibraltar which has just been issued, some interesting passages deal with the works undertaken by the local Sanitary Commissioners for improving the water supply. The scheme is estimated to cost £29,000, and consists in the formation of a catchment area of 10 acres on a sand-slope above Catalan Bay village, on the east side of the Rock, by the simple expedient of covering the sand with corrugated iron sheets on creosoted timber framing, and the construction of a tunnel for conveying the water from the catchment to the existing reservoirs on the west side. The scheme will, it is hoped, add 8 million gallons to the water supply on the Rock in an average year.

Batley Corporation Gas Supply.—The accounts of the Batley Corporation Gas Department for the year ended the 31st of March last show a gross profit of £10,454, against £10,897 in the previous year. During the past twelve months, receipts from the sale of gas amounted to £18,749, or £127 more than in the previous year. The gross income (including residual products) was £27,556; being £1231 more than in the preceding year. Exclusive of sinking fund and interest, the expenditure amounted to £17,101, whereas payments in the previous year came to £15,426. After deducting sinking fund and interest, the net profit is £3850, of which sum £2000 is applied in relief of the rates, and the balance transferred to the profit and loss account.

Denton Gas Department.—The accounts of the Gas Department of the Denton Urban District Council for the year ending the 31st of March have been issued by the Engineer and Manager (Mr. J. Chadwick Smith). The revenue amounted to £12,478, and the expenditure to £7765; leaving a balance of £4713. Of this, £1199 goes for interest, and £1225 for annuities; and out of the remainder, a sum of £1052 is placed to the sinking fund—the balance of £1236 being the net profit. According to the particulars of manufacture appended to the accounts, the quantity of coal used was 7196 tons; and it cost 11s. 10·70d. per ton. The total make of gas was 81,848,000 cubic feet, of which 73,304,943 cubic feet were sold; the make and sale per ton being 11,374 and 10,186 cubic feet respectively. The average cost of gas made was 1s. 5·84d. per 1000 cubic feet, and sold 1s. 7·93d.; the average selling price being 2s. 5·83d. per 1000 cubic feet.

Colchester Water Supply.—Last Tuesday, Major J. Stewart, R.E., held an inquiry, on behalf of the Local Government Board, on the subject of the proposed borrowing by the Colchester Corporation of £12,043 for the purposes of water supply at Lexden. The Town Clerk (Mr. H. C. Wanklyn) pointed out that since the Corporation took over the water-works in 1880, the demand for water had practically doubled, owing to the rapid extension of the town and garrison. During several recent dry seasons, the level had fallen to such an extent as to give the Water Committee reason to fear that a further succession of such seasons must result in the curtailment of the supply to the inhabitants. The opportunity of acquiring the water rights in Lexden Springs had arisen, and the Papillon and Errington Trustees were willing to convey these rights to the Corporation, and allow them to construct all necessary works, on the understanding that they should supply water to the Sheepen and Viaduct farms, which had hitherto drawn their supply from the springs. Included in the proposed expenditure was the sum of £500 for the purchase of Lexden Mill, the water supply to which might be affected by the new arrangement; but in the event of the supply being in excess of actual requirements, it was possible that the Corporation might let the mill. Mr. W. Mackworth Wood (the Consulting Engineer to the Corporation) having supplied the engineering details, a report by Dr. Thresh as to the quality of the water was put in; and the inquiry closed.

The Knowle and District Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for three purifiers on Green's system, complete with Weck's valve.

The approximate costs per lineal foot of laying water-pipes of the cast-iron spigot and socket kind in the streets of Providence (R.I.) are given as follows in the recent report of the City Engineer, Mr. Otis F. Clapp: 4-inch pipe, $0·556; 6-inch, $0·815; 8-inch, $1·098; 10 inch, $1·408; 12-inch, $1·809; 16 inch, $2·730; 20-inch, $3·817; 24-inch, $5·052; 30-inch, $7·195; 36-inch, $9·683. These figures include the ordinary appurtenances, except hydrants, and are based on iron at an average price of $35 per ton of 2240 lbs.

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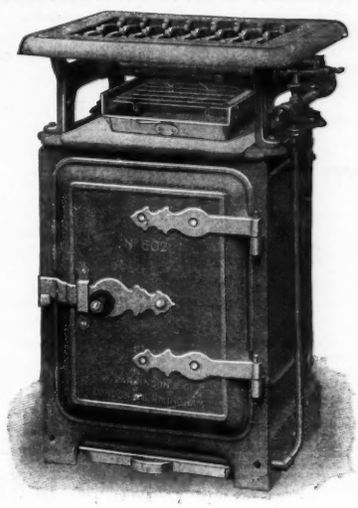

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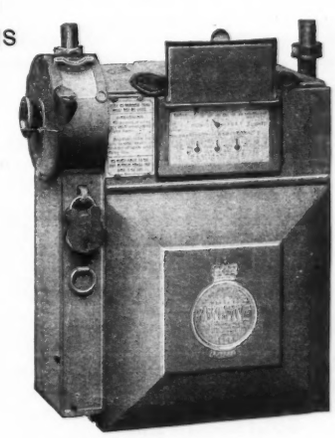

WRITE—

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COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

The Southport, Birkdale, and West Lancashire Joint Water Board have adopted the plans of the Engineer (Mr. Abbott) for a water supply to Altcar, as well as to the Christ Church district and Aughton; and they have authorized the necessary works.

By an announcement which appears elsewhere, it will be seen that the Newport (I.W.) Gas Company are inviting tenders for £3000 of 4 per cent. preference stock, which will be issued at a minimum price of par. Since the conversion and consolidation of the capital under the Company's Act of 1901, maximum dividends of £5 5s. per cent. have been paid on the ordinary stock, equal to £10 10s. and £7 7s. per cent. on the respective converted shares.

The Cwmbran and Pontnewydd Gas Company have placed an order with Messrs. R. & J. Dempster, Limited, of Manchester, for a Dellwik-Fleischer blue water-gas plant, to be erected in time for the coming winter. It will be unique of its kind, as it is designed to enable much smaller gas-works than heretofore to adopt a water-gas plant. We are informed that the firm have set to work the first portion of the Barking plant with very satisfactory results; and it is expected that the whole installation will be at work in about two months' time.

Messrs. Graham, Morton, and Co., Limited, have concluded a contract, obtained by open tender, with the Doncaster Corporation, for the supply of coal elevating and conveying plant for unloading the barges and distributing the load to the stores at the gas-works. The plant consists of one cased-in elevator 50 feet long, and made so as to rise and lower 14 feet. It is capable of elevating a minimum of 20 tons of large coal per hour. The delivery takes place at the top; the shoot being divided into a two-way shoot lower down. It can discharge on to either one or two conveyors, as may be required. These are of the steel plate type, 24 inches wide, one being fitted with an automatic weighing-machine. The two conveyors branch off to meet the steel plate conveyors placed in the coal-stores. The latter are 24 inches wide and 85 feet long. The plant in the stores is provided with throw-off ploughs to distribute the coal in the stores. The whole plant is replete with gearing, covered-in platforms and gangways, hand-railings, &c., for the conveyors outside. All gangways for the conveyors inside the two coal-stores are also supplied. The firm have just completed a large plant on this system for H.M. Government at the Royal Gunpowder Factory, Waltham Abbey.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS LIGHTING ENGINEER. No. 4257.
MANAGER. Stamford Gas Company, Applications by August 31.
DRAUGHTSMAN. C. & W. Walker, Donnington.
DRAUGHTSMAN. West's Gas Improvement Company, Manchester.
DRAUGHTSMAN. No. 4259.
FOREMAN PIPE LAYER. Bradford Water Department. Applications by September 6.
GAS FITTER. Redruth Gas-Works.
METER REPAIRER. No. 4258.

Plant, &c., Wanted.

EXHAUSTER. Chambers, Henley-on-Thames.

Plant, &c., for Sale.

ENGINE, EXHAUSTER, AND PUMPS. Richard Smith's Executors, Glasgow.
PURIFIERS, &c. South Bank and Normanby Gas Company.
STATION GOVERNOR AND EXHAUSTER. Henley-on-Thames Gas Company.
SULPHATE OF AMMONIA PLANT. Alloa Gas Department.

Company, &c., Meetings.

HARROW AND STANMORE GAS COMPANY. Albion Tavern, September 5, at One o'clock.
WEST KENT GAS COMPANY. Bridge House Hotel, September 5, at Three o'clock.

Stocks and Shares.

BRIXHAM GAS COMPANY. August 30.
NEWPORT (I. OF W.) GAS COMPANY. September 12.
WALKER AND WALLSEND UNION GAS COMPANY. September 9.

TENDERS FOR

Purifier.

ROTHWELL GAS DEPARTMENT. Tenders by September 8.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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AGRICULTURAL VALUE OF GAS LIME.—By CHARLES D. PHILLIPS, J.P. *Price 10s. 6d. per 100.*

THE COMPOSITION AND USE OF GAS LIME IN AGRICULTURE.—By (the late) Dr. VOELCKER, Professor of Chemistry to the Royal Agricultural Society of England. *Price 5s. per 100.*

NOTES ON WATER SUPPLY.—By J. T. RODDA Assoc.M.Inst.C.E., Assoc.M.Inst.Mech.E., Member of the British Association of Water-Works Engineers. *Price 5s.*

INTERNATIONAL ENGINEERING CONGRESS (GLASGOW, 1901)—THE PROCEEDINGS OF THE GAS SECTION. Edited by J. W. HELPS, M.Inst.C.E. *Price 5s.*

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Address, 99, CANNON STREET, LONDON, E.C.

ADVERTISEMENT No. 4249. AUGUST 2, 1904.

APPLICANTS are Thanked, and informed that a selection for the above HAS BEEN MADE.

WANTED, immediately, an experienced GAS-FITTER.
Apply, by letter, stating Age, Experience, and Wages required, to the MANAGER, Gas-Works, Redruth, CORNWALL.

DRAUGHTSMAN wanted, thoroughly familiar with Gasholders and general Gas-Works Plant, and capable of making Working Drawings and taking out Quantities for estimating or ordering materials.
State Age, Experience, and Salary required, to C. & W. WALKER, LIMITED, Donnington, Newport, SHROPSHIRE.

STAMFORD AND ST. MARTIN'S GASLIGHT AND COKE COMPANY.

WANTED, a qualified Engineer as MANAGER for the above Works.
State Salary required, with References and Qualifications.
Applications to be made to the Chairman not later than Aug. 31.

BRADFORD CORPORATION WATER-WORKS.

FOREMAN Pipe-Layer wanted, to take charge of the Pipe-Laying Department in connection with the City supply, and of the Workshops at the Pipe and Meter Depôt.
Applicants must have had Experience in Laying, Testing, and Repairing Water-Mains, Repairing of Meters, and Management of Workmen.
Salary £3 per week, with House, Coal, and Gas.
Applications, accompanied by Three recent Testimonials, addressed "Foreman Pipe-Layer," to be sent to Frederick Stevens, Esq., Town Clerk, Bradford, not later than Tuesday, the 6th of September, 1904.
By order,
JAMES WATSON, M Inst.C.E.,
Water-Works Engineer.
Water-Works Engineer's Office,
Town Hall, Bradford, Aug. 15, 1904.

DRAUGHTSMAN wanted in an Engineering Office in Westminster.
Apply, by letter, to No. 4259, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AMETER Repairer wanted by a London Gas Company, used to Copper Smithing, Wiring, and odd jobs. Good Wages for a skilful man.
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DRAUGHTSMAN wanted, experienced in Mechanical and Constructional Engineering, also Gas-Works Plant.
Apply, stating Age, Experience, and Salary required, to WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Miles Platting, MANCHESTER.

GAS Lighting Engineer wanted as representative for London District, to Draft his own Schemes and secure their adoption in Large Buildings, Works, &c. Good opening for the right man.
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WANTED, a second-hand Exhauster in good Condition. Capacity 15,000 to 20,000 cubic feet per hour, with Valves complete.
Particulars to Mr. J. CHAMBERS, 17, Hart Street, HENLEY-ON-THAMES.

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W. NIXON, Manager.
South Bank, Aug. 3, 1904.

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THE Alloa Town Council have for disposal an AMMONIA STILL and HEATER (Gillespie's). Still 14 feet high by 2 ft. 6 in. diameter.
The Apparatus is being displaced by larger Plant, and has been in use only a few Years. In very good working condition.
Offers to be lodged with J. W. NAPIER, Manager.

ROTHWELL URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council invite Tenders for the supply and erection of a PURIFIER, 10 ft. by 10 ft. by 4 ft. deep, with Connections, Lifting Apparatus, &c.
Drawings and Specifications may be seen, and full Particulars obtained, at the Market House, Rothwell, Kettering, or at the Office of the Engineers, Messrs. Eunson & Son, Northampton.
Sealed Tenders, endorsed "Tender for Purifier," to be delivered to the undersigned not later than Wednesday, the 8th day of September next.
The Council do not bind themselves to accept the lowest or any Tender.
FRED MAYALL,
Deputy Clerk,
Market House, Rothwell,
Kettering, Aug. 22, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage, please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

WALKER AND WALLSEND UNION GAS COMPANY.

SALE OF £12,000 NEW ORDINARY STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of the Walker and Wallsend Union Gas Company to SELL BY TENDER, to be received at the Company's Office, Neptune Road, Wallsend-on-Tyne, not later than 2 p.m. on the 9th day of September, 1904,

TWELVE THOUSAND POUNDS OF NEW FIVE PER CENT. ORDINARY STOCK OF THE COMPANY.

The Stock now for Sale is a first issue of Additional Capital under, and subject to, the provisions of the Walker and Wallsend Union Gas Act, 1903. The Standard Rate of Dividend is Five per cent., subject to Sliding-Scale Clauses, under which the authorized rate of dividend payable so long as the present price of the Gas continues, is:—

£6 7s. 6d. PER CENT. PER ANNUM.

The Company has since 1884 paid the full statutory dividends authorized under the Sliding-Scale provisions of the 1884 Act.

Any amount of Stock in multiples of £1 may be applied for. A deposit of £10 per cent. on the nominal amount of Stock applied for must accompany each Tender, and the balance be paid on or before the 30th of September, 1904.

MINIMUM PRICE £130 PER CENT.

The average annual increase of Gas sold during the past Seven Years has been about 8 per cent. The quantity in 1896 was 126,320,000 cubic feet; while in 1903 it was 213,363,000 cubic feet. This rate of increase has been more than maintained during 1904, resulting, in comparison with the corresponding period of 1903, in an increase of 14·71 per cent. for the Half-Year ending June 30.

The number of Consumers on the Company's Books at June 30, 1904, shows an addition to the number at December 31, 1903, of 23·16 per cent.

For Particulars, Forms, and Conditions of Tender, apply at the Office of the Company, Neptune Road, Wallsend-on-Tyne.

By order of the Board,
CHAS. H. ARMSTRONG,
Secretary.

Offices: Neptune Road,
Wallsend-on-Tyne, Aug. 5, 1904.

NEWPORT (ISLE OF WIGHT) GAS COMPANY.
INCORPORATED BY THE NEWPORT (ISLE OF WIGHT) GAS ACTS, 1870 AND 1901.

SALE BY TENDER OF £3000 4 PER CENT. PREFERENCE STOCK.
MINIMUM ISSUE PRICE—PAR.

THE Directors invite Tenders, at not less than par value, for £3000 4 per cent. Preference Stock authorized to be issued under the powers and provisions contained in the Newport (Isle of Wight) Gas Act, 1901.

Particulars and Conditions of issue and Forms of Tender may be obtained on application to the Secretary, at the Company's Offices, Newport (Isle of Wight), or of the Company's Bankers, the National Provincial Bank of England, Limited, Newport (Isle of Wight) Branch.

Tenders must be delivered on or before the 12th of September, 1904.

Payment for the Stock to be made as follows:—On application, 20 per cent. on nominal amount applied for, and the balance on or before the 1st of November, 1904.

The Dividends will be payable half-yearly, and will accrue from the date of payment in full.

By order of the Directors.
FRANK KING,
Secretary.

Newport (Isle of Wight),
August, 1904.

SALE OF £4000 5 PER CENT. PREFERENCE SHARES AND £2000 ORDINARY SHARES IN THE BRIXHAM GAS COMPANY.

MR. S. F. DUGDALL is instructed by the Directors to SELL BY AUCTION, at the George Hotel, Brixham, Devon, on Tuesday, the 30th of August, 1904, at Three o'clock precisely, in separate Lots,

400 PREFERENCE SHARES OF £10 EACH,

entitling the holders to a cumulative Dividend of 5 per cent., which will be paid in priority to the Dividends on the Ordinary Shares, and

200 ORDINARY SHARES OF £10 EACH,

entitling the holders to a dividend *pari passu* with the 10 per cent. Dividend to the holders of the Original Shares up to the Standard Rate of Dividend of 7 per cent. The Ordinary Shares are subject to the Sliding-Scale, under which the Standard Price of Gas is 4s. per 1000 cubic feet. The Company was established in 1838, and incorporated in 1904 by Special Act of Parliament. The authorized capital is £20,000, of which £14,000 remains to be issued.

The Sale of Gas for 1903 was 7,619,300 cubic feet, showing an increase of 692,200 feet on the previous year. The new Capital is required, among other things, to pay for further extension rendered necessary by the rapid growth of the demand for Gas in the District. It will be issued free of expense.

Detailed Particulars of Sale, with Form of Instructions to Purchase, obtainable, post free, of Messrs. SCHULTZ, COMINS, & Co., No. 50, Cannon Street, E.C.; Messrs. MARTIN & NICHOLSON, No. 29, Queen Street, E.C., the Company's Solicitors, or their Agent, W. L. PARSONS, Esq., Solicitor, Brixham, Devon; or of the AUCTIONEER, Waterloo House, Brixham, DEVON.

HARROW AND STANMORE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Monday, the 5th day of September, 1904, at One o'clock precisely, to receive the Directors and Auditors' Reports, to declare a Dividend, and to transact any Ordinary Business of the Company.

The REGISTER OF TRANSFER BOOKS WILL BE CLOSED from Aug. 29 until Sept. 5, both inclusive.

By order of the Board,
J. L. CHAPMAN,
Secretary.

Gas Office: Roxeth, Harrow,
Aug. 19, 1904.

WEST KENT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Bridge House Hotel, London Bridge, on Monday, the 5th of September, at Three o'clock in the afternoon, precisely, for the purpose of receiving the Directors' Report and a statement of the Company's Accounts for the half-year ended June 30, 1904, to declare a Dividend thereon, and for General Business.

The TRANSFER BOOKS WILL BE CLOSED from the 20th of August, until after the Meeting.

By order of the Board,
ROBERT S. KEYS,
Secretary.

Office, 4, Brighton Chambers,
Denman Street, London Bridge, S.E.,
Aug. 8, 1904.

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Author of the "Gas Engineer's Pocket Book."
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Sperm Value 878·85 lbs. per Ton.

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Above the Average in Weight and Quality of Coke.
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CITY ROAD, LONDON, N.,
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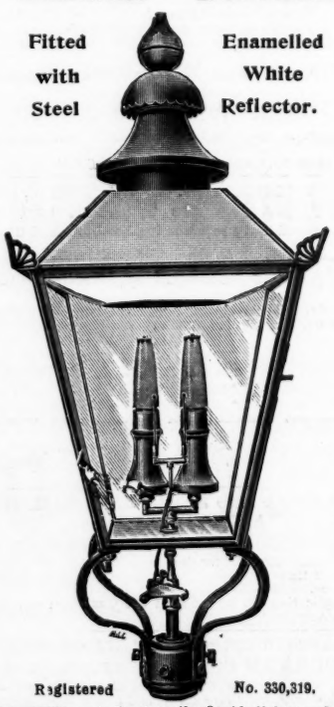

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REDUCE EXPENSES, INCREASE PROFITS by doing your own Whitewashing or Limewashing

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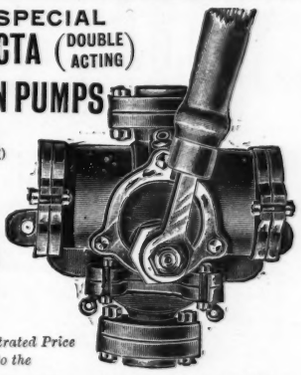

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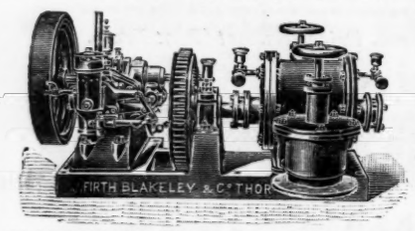

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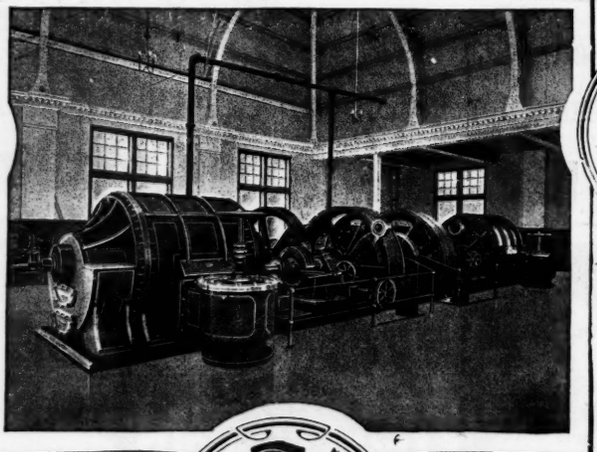

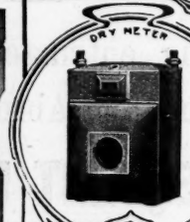

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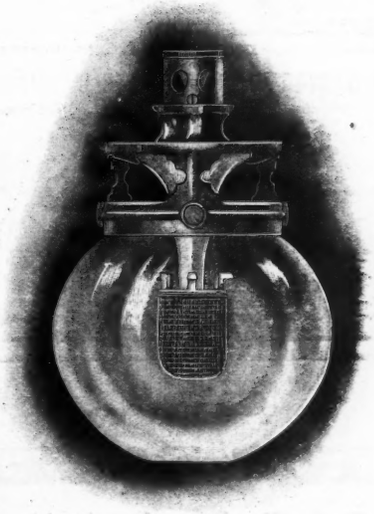

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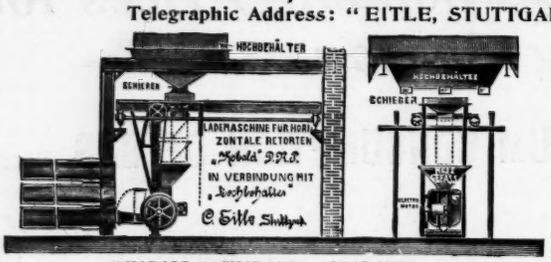

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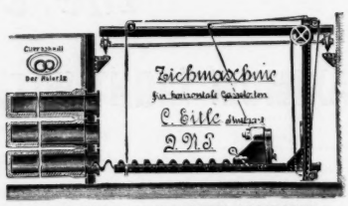

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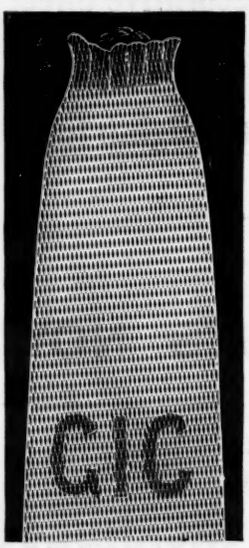

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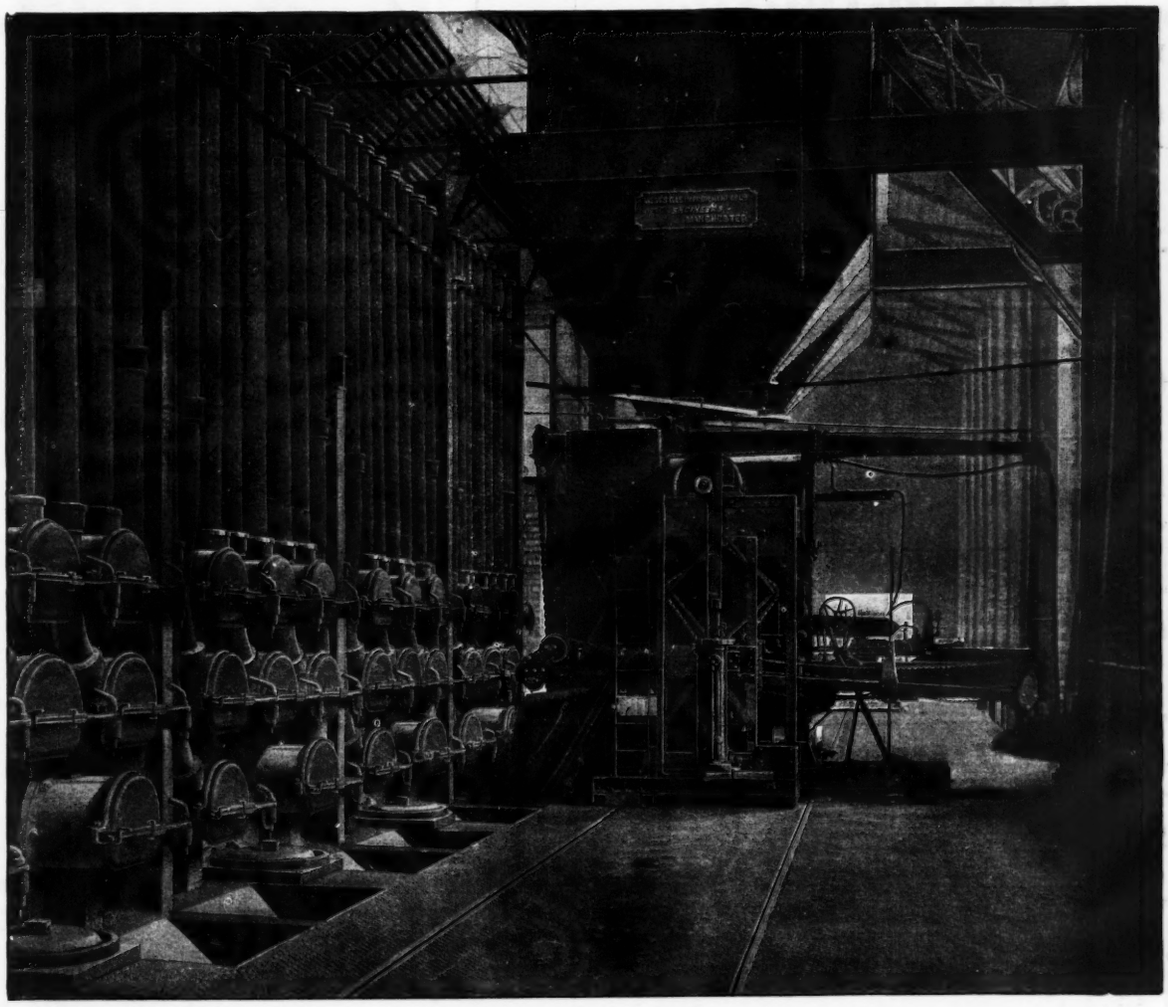

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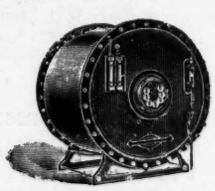

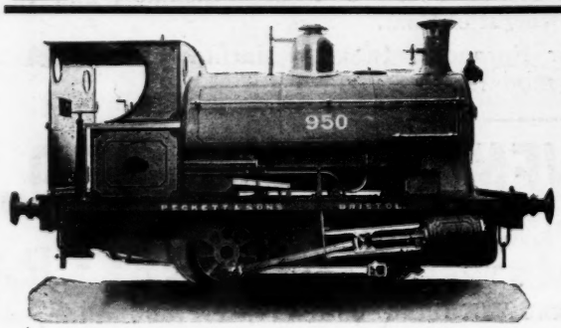

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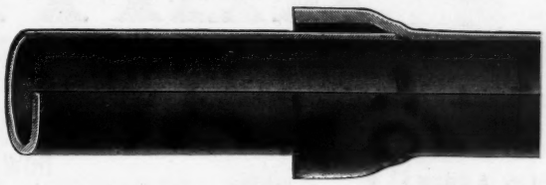

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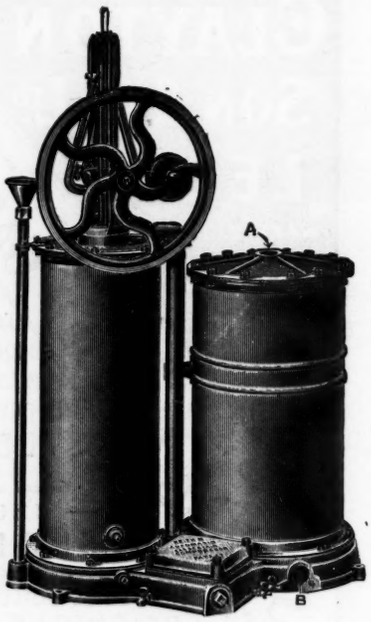

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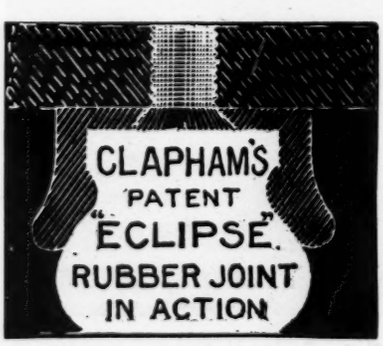

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